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BAGHDAD TO DAMASCUS VIÂ EL JAUF, NORTHERN ARABIA.*

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The leave of Captain Aylmer and myself from East Africa falling due about the same time last autumn (1907), we decided, if possible, to try to return to England *viâ* the Persian gulf, Baghdad, and Damascus; but, instead of following the usual route from Baghdad to Damascus along the Euphrates, we intended to try to go south-west from Baghdad to El Jauf,† which is situated in *North Central Arabia*, on the northern edge of the great Nefud (or sandy desert), and from there go up north-west, eventually coming out at Damascus by way of the Jebel Hauran. El Jauf is, of course, not altogether unknown, having been visited by Wallin in '45, Palgrave in '62, Guarmani in '64, Huber in '78, Euting in '83, the Blunts in '79, Nolde in '93, and a Kerak missionary called Forder in '01. All these, however, visited El Jauf coming from the west, Wallin and Palgrave from Maan, and Huber, Euting, the Blunts, and Nolde from Damascus; Guarmani came up from Hail (if his account is trustworthy). To the best of my belief El Jauf had not previously been reached from Baghdad, or, in fact, anywhere from the east by any other Europeans, nor had the intervening country been explored in any way. Our chief difficulty lay in getting away from Baghdad, as we were for a long time unable to get any one to act as our "rafig," or guide and friend, without which it is impossible to travel in anything like safety in Arabia. Shortly after our return to Baghdad from Kerbela, however, we were fortunate enough to hear of a Bedu who was almost immediately returning to his tribe, the Ibn Mijlad

* Read at the Royal Geographical Society, February 22, 1909. Map, p. 628.

† In strict geographical parlance Jauf is not in Arabia at all, but on the Southern limit of the Syrian Hamid.

section of the Bishr Anaizeh, who were then somewhere in the desert to the south-west of Kabweisa. This Bedu, Mahomet el Mathi by name, was a man of importance in his tribe, and was escorting back with him some merchants of cloth, and camel traders, and he was willing, for a price, to let us accompany him to his tents, and said that from there, for a further sum of money, he would help us to get on to El Jauf. He stipulated, however, that we brought our own camels and kit, and also asked us to dress in Beduin costume. This we did; to dress in Arab costume when travelling in the interior of Arabia being, in my opinion, very necessary, for to dress in European clothes would, I think, cause a lot of unpleasantness, if not actual danger. Neither Captain Aylmer nor myself ever tried to pass ourselves off as Beduin when in conversation with people we met, as, of course, our Arabic would have given us away at once, but a few yards off, with the "kofia," or head-covering, up round our faces, we looked very much like the other members of our party, and were frequently mistaken for Arabs by Beduin we met, until we got into conversation with them.

We left Baghdad on January 9, 1908, with our guide and friend, Mahomet el Mathi, and a party of about twenty merchants and their assistants, on camels. Captain Aylmer and myself rode female camels (dlool), for which we paid about thirteen Turkish lira each, and our servant bestrode a male camel, which cost about twelve lira Our supplies we carried with us on our camels, and these consisted of a few changes of clothing, and some dates, rice, flour, coffee, tea, sugar, salt, fat, onions, and a few tinned things. Throughout all our trip we ate and lived with our guides and other Arabs we met as Beduin, and the tinned food, though a nice change, was really unnecessary; it is heavy, and takes up a lot of room, and were I to go into Arabia again, I do not think I should attempt to take anything beyond the things carried by Arabs themselves when travelling, such as flour, dates, salt, rice, fat (samn), coffee (a necessity), and tea and sugar (a luxury), and perhaps a few onions, that are much appreciated by the Arabs, and help to flavour the otherwise somewhat tasteless rice. Our first objective was Kabweisah, an Arab town under Turkish government, some 90 miles north-west of Baghdad, and a few miles west of Hit, a small town on the Shatt-el-Frat (Euphrates). Here we were to pick up two or three more traders, who were going to do business among the Anaizeh, under the auspices of our guide, Mahomet el Mathi.

At Kabweisa we picked up the rest of our caravan, and on January 16 started out into the desert for the tents of Ibn Mijlad of the Dahamshah section of the Bishr Anaizeh. Our guide was not certain as to the exact whereabouts of his tribe, but knew they were somewhere to the south-west, so having filled our girbehs (water-skins) at the well of Zazzur, outside Kabweisa, we took a south-westerly line across the desert. We travelled thus for four days, and on the fifth reached our guide's tents in

a district called Awaj. All these four days we were passing over a rolling steppe, covered for the most part with short herbage or scrub about 1 to 1½ feet high. This herbage is mostly good grazing for the camels, a feathery sort of scrub called "arrutha" being particularly appreciated by them. The soil the whole way was gravelly. No water at all was seen, but for the greater part of the first two days we followed up the course of the Wadi Hajia, in which in the rainy season, we were informed, there is water, but which, when we were there, was quite dry. All this country was, of course, without any villages or houses of any sort, there being absolutely nothing in the shape of a house between

BEDUIN IN THE DESERT.

Kabweisa and Skaka. The only inhabitants of this district are Beduin, who live in their black goats'-hair tents, and keep moving every day or so, with their flocks of camels and sheep, in search of pasturage and water. The tribe who, for the most part, frequent the district we passed through for these first four days are called Delaim, but we only saw one party of about ten tents. The Delaim inhabit the country along the Shatt-el-Frat (Euphrates) from Kerbela to Hit, and are divided into two sections—the "fellahin," or cultivators of land, who live along the river-bank in houses and till the soil, and the "Beduin," who live a roving life in the desert with their flocks; it was a party of these latter that we came across. They are a numerous tribe, and, from information given us by some of them, we estimated that they must number at least 13,000 tents.

A noticeable thing about all the country between Kabweisa and the hollow of El Jauf is the presence of many "rigms," or piles of stones, which mark the boundaries of the authority of various Beduin sheiks. On the fifth day after leaving Kabweisa, as I have said, we reached the tents of our guide, and during our stay with him, four days, we were exceptionally kindly treated, not only by him, but by Skeik Ibn Mijlad and all the members of the tribe that we met. The Anaizeh are divided into two big sections, the Bishr, who occupy roughly the north and east of the great Syrian desert, and the Thumma Mislim, who occupy the more western part of it. Some of the principal subsections of the Bishr are the Sebaah, Fedaan, and Amarat (of which the Dahamshah are a further subdivision); and of the Thumma Mislim are the Roalah, Sualmah, Auled Ali, and Ali Sajaah. As regards the numbers of the Anaizeh, however, we found it impossible to arrive at any satisfactory estimate, as the various numbers, we were told, varied so greatly. Near the tent of Ibn Mijlad, where we camped, we counted about 250 tents.

Our four days' stay with the Anaizeh was most interesting, and gave us an excellent insight into the life of the Beduin in the desert. During that time we twice moved on with them in search of grazing and water. The women on these occasions generally ride in a sort of cradle arrangement, with a big kind of awning over it, which is called a "chittab." The older men of the Anaizeh, and even some of the younger ones, seem pretty devout Mohammedans, saying their prayers five times a day with the greatest regularity. They are not big men, but decidedly lithe and wiry; their complexions are darker than that of the town dwellers in Hail and El Jauf; their features are clear and straight cut, and their eyes are dark; they all wear their hair in plaits, one hanging down each side of the face. After two years of Africa, both men and women impressed us as being very good looking, and so, I think, most people would consider them. The women of the tribe, although they generally keep to their side of the tent (harem), and do not join in the discussions amongst the men round the fire over coffee (as is the custom among the women of the Sleyb tribe, and also the Ahl El Jebel, on Jebel Hauran), are nevertheless much freer than in the towns. They are not veiled, and, moreover, seem to do most of the work when there is any moving of tents, cutting of fuel, etc., to be done. Horses amongst them seem very rare, and, in fact, we only saw about eight or nine among the Ibn Mijlad when we were with them, the "dlool," or female camel, being almost entirely used for riding purposes, it being considered not at all the proper thing to ride a male camel.

It may be interesting here to note that an entirely different noise is used to urge on a female camel to that which is used to a male, and it was my experience that if you used the wrong one they took not the smallest notice. To a female camel the noise is "Hi!" starting low and

raising the voice sharply; and to a male, "Za-ha!" with the accent on the last syllable and the first short.

The life of a Bedu is one of supreme idleness, and they do absolutely nothing but wander from day to day with their flocks, the elder men spending all their time sitting round the fire drinking coffee, and the younger men leading an equally lazy existence, except in the winter months, when they go out on "gazus," or raids, to capture the flocks and tents of their enemies. Their wants are very few, their most extrava-

ALI IBN GAARDE, ONE OF THE RETAINERS OF FEYSUL IBN RASHID.

gant wishes being for rifles, revolvers, and field-glasses. Their food and clothes are simple, the former being chiefly rice, flour, dates, camels' milk, coffee *ad lib.*, and very occasionally meat, no intoxicating drink ever being found among them; their clothes consist of a rough "abba," or goats'-hair cloak, a "tobe," or white shirt with long sleeves, a "zaboon," or sort of light robe, and baggy pantaloons; on the head a Manchester cotton, red or blue, spotted handkerchief (kofia), and a goats'-hair rope round it, to keep it on (agaal). They do not appear

very strong, many of them suffering from bad coughs; also we had many complaints of bad digestions, and, moreover, the eyes of many of them seemed weak and bad, a consequence, they say, of drinking too much coffee. The Roalah tribe, we were told, would probably be somewhere between us and El Jauf, and our guide, Mahomet el Mathi, said that although his brother Abdulla would go with us and show us the way, yet it was absolutely necessary to take a Roalah with us to act as "rafig," in case we met any of his tribe. After considerable difficulty we managed to get an old Roalah, who, for an exorbitant sum, consented to accompany us to El Jauf, and who, I should add, proved entirely useless, as we met none of his tribe, and he never by any chance did any work in camp on our journey. On January 24, therefore, having purchased another camel for Abdulla to ride, we set out once more for El Jauf, after bidding adieu to our late guide and host, Mahomet el Mathi, and our other friends among the Anaizeh.

On leaving camp we passed through a district called Aamij, from the wadi of that name, which we followed up for some way, and which eventually joins the Wadi Hauran. Like all other wadis we crossed on this side of El Jauf, there was no water running in it, but we obtained some by digging a few feet. All this district goes by the general name of El Wadian, which, I need hardly say, is just the plural of wadi (watercourse). The first two days the country remained much the same as before we reached the Anaizeh—big rolling steppes, covered with short herbage. On the evening of the second day out we came to a big range of hills rising some 80 to 90 feet above the surrounding plain, called the Hazimiat, which run roughly east and west. From this day onward, until we reached El Jauf, the character of the country completely changed, and became exceedingly hilly, the hills being some of them 150 to 200 feet high, and steep, rugged, and rocky, some of the gradients we had to go down on our camels being almost precipitous. Instead of short scrub, as before, all the country became covered with rocks and boulders, except in the hollows and wadi beds, where splendid green grass was growing, and, in many cases, wild flowers. We crossed many dry wadis, all very much the same size, about 20 to 30 yards wide, and as they are all marked on Captain Aylmer's map, it is unnecessary to give their names. They were all dry with the exception of the Tebel and several others, where we were lucky in finding one or two small and dirty pools of water standing.

In the rainy season our guides told us that there is water in all of these. In the Tebel there are shallow wells every three hours down the stream, made by the Sleyb tribe, and in summer water can always be found in them by digging a few feet. The formation of the country from the Hazimiat is, I think, chiefly sandstone. We brought back a few geological specimens with us, and these Prof. Hughes, of the Geological Museum of Cambridge, was kind enough to name for us.

The sandstone of Jebel Amghar and the Jauf district is of the most fascinating shades of purple, blue, lilac, and yellow. Signs of cultivation, or old cultivation, we saw none, with the exception of one place near the Hazimi wad, where we saw lines of stones, which our guide told us marked out what were once old patches of cultivation, but I think that even in the rains it would not be possible to cultivate anywhere except in some small patches actually along a few of the wadi beds. Beyond Kabweisa we did not see very much in the way of game, but on three or four occasions saw herds of "reimy," or small gazelle, about the size of "Thomson's Gazelle" of East Africa, but with horns

EL JAUF, LOOKING SOUTH FROM MAARID. FEYSUL IBN RASHID'S CASTLE IS SEEN IN THE DISTANCE.

a little longer and a little more turned back. Lesser bustard and sand-grouse were plentiful all along our route to El Jauf, and we saw occasional partridges and hares. Both gazelle and birds were very wild indeed, the former generally bolting when we were about half a mile away, and not being seen again. This, I suppose, is due to the fact that most of the Beduin who wander over this district are armed with rifles of sorts, and shoot at all game they see, and also are possessed of many hawks, with which they course hares and birds, and with a bigger breed of hawk, even gazelle. We were fortunate in having chosen the best time of the year to travel in, and, as a rule, the climate was excellent, but at times it was very cold at night, the thermometer one night registering 25½°, and the change to midday was very great,

when it registered 91°—a change of 65½° between morning and midday.

Near the Abthena wadi we were fortunate enough to fall in with some of the Sleyb tribe. Apart from the fact that they are an interesting race, we were also fortunate in coming across them, as our guides had lost their way, water was running short, and we did not know where to look for any, and they were able to take us at once to where we could fill up our girbehs. Their origin is wrapt in mystery, but I have heard several theories put forward, one being that they are descended from the old Crusaders, and that the name Sleyb is really "Saleeb," which means "a cross;" another being that they are the original inhabitants of the peninsula, and the name comes from the word *asl* (origin). They are small of stature, but a nice-looking people, and the women are prettier than those of other Beduin that we saw. They are Mohammedans, but not very particular in their observance of the rites and laws of Islam. Other tribes of Beduin despise and prey on them; as soon as they are becoming rich the Anaizeh and other Beduin attack them and carry off their flocks. They have few camels, but many sheep, goats, and donkeys, and the latter are noted for their endurance; in fact, one not more than 12 hands high covered 100 miles with us in two days and a half, carrying a man who must have weighed at least ten stone, and this over very bad country, all rocks and sand. The Sleyb are the great hunters of the desert, and have a wonderful knowledge of the country and the whereabouts of any water. The men wear quaint smocks, just like our shepherds' smocks, made out of the skin of gazelle they have shot, one smock requiring the skins of about fifteen gazelle. The women wore the ordinary Beduin woman's robes. Their guns would make the big-game shooter of East Africa marvel, and we saw one truly wonderful matchlock all tied up with rope and wire with which the proud owner said he frequently killed gazelle at 40 and 50 yards. They are a much more cheerful childlike lot than the Anaizeh. In the evening we went to a concert at one of their tents, where both men and women were sitting together round the fire. They play remarkably well on the "mutbakh," an instrument consisting of two hollow reeds bound together and sounding very much like a bagpipe, and they are also wonderful poets, continuing for hours telling stories in verse, the last word of each line of which rhymes, and is repeated with exclamations of surprise, joy, and sorrow, etc., by the listeners with very good effect.

We were sorry to leave this humble but hospitable people, and took one of their number with us to show us the way to El Jauf. The district of El Jauf is a large hollow, which gives one the impression of having once been a big lake, or inland sea. The ground in this big depression is very rocky, and is covered with great flat layers of purple and reddish sandstone. The town of El Jauf, that takes its name from

the district, lies on the west edge of this basin, in a hollow about 2 miles broad; but coming from the east the first town to be reached in this hollow is not El Jauf, but Skaka, which is about 30 miles east of El Jauf. Skaka is an oasis, consisting of many thousand date palm trees, which yield the most delicious fruit, and about three or four hundred houses, all built of mud, but solidly constructed, and many of them having two storeys, and all, of course, with the flat roofs of the East. The population we put down as about 1700. After visiting El Jauf, it struck us that Skaka was much the cleaner, more thriving-looking place of the two, and what little trade is done in the

EL JAUF, LOOKING NORTH FROM OLD CASTLE AT MAARID.

district is, I think, chiefly carried on at Skaka, where we found some "meshedani," or merchants from Kerbela (Meshed Hussein), and Nejef (Meshed Ali) living. Water there is in abundance from wells both sweet and brackish, the crops of barley, such as they are, and the date palms being watered from the latter by means of the "jarrad," or skin bucket, drawn up by oxen or camels, and emptied automatically. This method of watering the crops is common all over Eastern Turkey-in-Asia and Northern Arabia. The water is carried off by means of little channels to the date gardens and patches of barley. The sweet-water wells were about 50 to 60 feet to the water. At the north end of the town there is an old castle perched on a rock, called Gasr el Zabl, of, I think, ancient Arabic origin, which, the

inhabitants told us, is now sometimes used as a prison. Arriving at Skaka total strangers, and not pretending to be Mohammedans, we were, nevertheless, at once put up and treated with the utmost hospitality by a meshedani called Hussein, and all we met in Skaka treated us in an equally hospitable way.

Skaka, which, in common with the rest of the district of El Jauf, belongs to Ibn Rashid, is administrated by one of his emirs, who resides at El Jauf, but who has his "wakil," or agent, at Skaka. This same agent, Ali Ibn Gaarde by name, when he heard of our arrival, and our intention of proceeding to El Jauf, came and informed us that we must wait at Skaka until he got permission for us to proceed from Feysul Ibn Rashid, brother of the late Sultan of Hail, who had, one month previously, come to El Jauf as emir of the district. This news about Feysul Ibn Rashid being at El Jauf was by no means welcome to us, as we had no letter of introduction to him, and the "backsheesh" we had brought to give to his predecessor (a rifle) would be scoffed at by a man of his importance. On the day after our arrival in Skaka, the answer came back from Feysul Ibn Rashid giving us leave to proceed to El Jauf, and bidding us welcome. The journey from Skaka to El Jauf takes about seven hours on camels, the country passed through being hilly, with occasional patches of "nefud" (sand), the rocks all being of sandstone. At a place called Muaysel, two hours from El Jauf, there is an old disused castle, and also a spring and two wells; and at Jawa, a little further on, there is a small hamlet, and a little cultivation on the Ruth el Faras wadi. Arrived at El Jauf, we were taken at once to the emir's castle, a large building made of mud and stones, and about 90 yards long by 50 broad, with walls about 40 feet high and a tower at each corner about 60 feet high. It is built entirely for defence, there being no windows, and the door is in an angle of the wall, and strongly barricaded. We were shown into a waiting-hall and given coffee, and after a minute or so were led out into a courtyard (where we saw the two old cannons of English make mentioned by Lady Anne Blunt) and up a staircase to interview Feysul Ibn Rashid. We were somewhat doubtful as to how the interview would go off, as Feysul's reputation is not too savoury, as the following story may show.

Some two and a half years previous to our visit, Abdul Aziz, Sultan of Hail, had died, leaving three sons, called Metaab, Mishaal, and Mahomet, aged respectively about twenty, fifteen, and ten years, the eldest of whom succeeded to the Sheikat. On Abdul Aziz's death, there were also alive his three second cousins, called Sultan, Feysul, and Saoud, sons of Hamud, and all of them grown men. After Metaab had been about six months on the throne, the three sons of Hamud plotted to oust him, and, with this object in view, asked him and his two younger brothers, and a lad called Tellal, a cousin and a son of Naif Ibn Tellal,

to a sort of picnic outside the town. After feeding, it was proposed that the slaves should give a display on horseback, firing off rifles, etc., and while this was going on Sultan, Feysul, and Saoud took up rifles and shot the four boys, killing them all except Mahomet the youngest, who was badly wounded. This lad was taken back to his mother who, by the way, happened to be the sister of these three scoundrels, and some two months after, fearing the boy would recover, Saoud went, with six slaves, to his sister's house, and cut the poor boy in pieces before her eyes. After this outrage, Sultan Ibn Rashid, the eldest of these ruffians, became supreme at Hail. But, as is the way in this part of the world, Sultan has been murdered by Saoud since we were there, and Saoud

THE CASTLE OF FEYSUL IBN RASHID AT EL JAUF.

and Feysul have in their turn been captured and imprisoned by the uncle of the infant son left by Metaab.

We found Feysul Ibn Rashid sitting in a low room, the roof of which was supported by wooden pillars. All round the sides of the room were spread carpets, on which sat his viziers and members of his court. He himself sat behind the open fireplace, the opposite side of the room to the door, and on our entrance, rose and came forward to greet us. He is a man of thirty-three years, with a dark pointed beard, good regular features, but eyes that are cold and cruel, and he has a nervous, fidgety manner, and was all the time arranging his abba (cloak) and combing and curling his moustache and beard, and admiring himself in a small cheap looking-glass that hung just behind him. Above his head on the wall hung his silver-mounted walking-stick and a

sword, the sheath of which was also covered in silver. He was very richly dressed, his "abba" being of fine cloth covered with gold embroidery, his zaboon of worked silk and his agaal (rope to keep on headdress) heavy with gold wire.

On our arrival at the house placed at our disposal, Captain Aylmer and myself congratulated ourselves on our good fortune in having such a cordial welcome, and thought we were in for a really good time in El Jauf, but I regret to say that we were speedily disillusioned. We had not been there more than five minutes when Feysul's head slave, a richly dressed personage called Dahm, came to tell us that the emir would not take our camels or our money, as he had plenty of both, but that he would like any things of European make or of interest that we happened to have. This was only too true, and during our five days' stay there, there was a continued procession of slaves and hangers-on from the castle demanding things for the emir and his viziers and favourites, and demanding them in such a way that it was impossible for us, situated as we were, to refuse, until at last we had practically nothing of any value left, having been fleeced of watches, revolver, compasses, various clothes, and other articles of our kit.

Apart from this system of more or less polite robbery, we were well treated by the emir, and had our food sent us from the castle by him. About three or four times a day we had a "royal command" from him, and used to go up to the castle and drink many cups of coffee and excellent sweet tea with him, and talk about his country and Europe. He asked many questions about England and its people, of which he displayed a profound ignorance, except with regard to the name of our King and Her late Majesty Queen Victoria, both of whose names he knew. He was always very genial on these occasions, and I honestly think he considered he was treating us very well in not taking all we had, and turning us adrift to die in the desert.

Before leaving the subject of the Ibn Rashids it would perhaps be as well to touch lightly on their relations with their various neighbours. The first in importance, of course, are the Turks—and it must be remembered that I am speaking of eight months ago, before the present constitution was granted to them. The Turks appeared to have little or no hold over the Sultan at Hail, for not only did friendly relations between the two powers not exist, but there was the strongest feeling of dislike for the Turks on the part of the Rashid at Hayil. This dislike is, I was led to believe by an influential man in El Jauf, to a certain extent due to the fact that previous to the late Ibn Rashid's accession the Ottoman Government used to pay a small subsidy to the Sultan at Hail, who admitted the Turkish suzerainty. When, however, the late Ibn Rashid murdered his cousins and made himself Sultan, that allowance was stopped by the Turks, and instead of being paid to him was given to the infant child of Metaab (the eldest of the murdered

cousins), which child had been taken to El Medina for safety. Next in importance to the Turk among the neighbours of the Ibn Rashids are the Ibn Saouds of Er Riad, the ancient rivals of the Sultans of Hail. A desultory warfare is still carried on between these two powers with varying fortune. When at El Jauf, we were told that in the spring of 1907 the Ibn Rashids had defeated Ibn Saoud with great slaughter, killing 300 of his men, and Ibn Rashid was consequently then "top dog," but since we were there I understand the tide has turned the other way once more, and I understand that Ibn Saoud is now in the ascendant. Beyond these two powers, the Turks and Ibn Saoud, there is no one of the neighbours of Ibn Rashid of much importance except the Anaizeh.

FEYSUL IBN RASHID AND FOUR OF HIS VIZIERS ON THE ROOF OF CASTLE AT EL JAUF.

With the Roalah section of the Anaizeh under Ibn Shailan the late Ibn Rashid was at peace when we were there, and Ibn Shailan himself had just been paying a visit of courtesy to Feysul Ibn Rashid at El Jauf and brought him presents as a token of his friendship. With the Bishr Anaizeh, however, there was war, and not long before our arrival at El Jauf, Feysul Ibn Rashid had been raiding some of the Bishr Anaizeh with considerable success, if the reports of his retainers were to be believed.

We were five days in El Jauf, and consequently had time to look round us. The town runs north-west and south-east, and lies in a belt of date palms about 2½ miles long by half a mile broad. At the north end is the old castle Maarid and the "suk" or bazaar, and at the south

end is the emir's castle, a building made in the middle of the last century. The "suk" is not worthy of the name, being merely a cluster of houses round the castle, and there are no shops there, all buying and selling being done in the private houses of the merchants, both here and at Skaka. In neither place was there anything to be bought when we were there, except a little coffee and flour, there being no sugar, rice, tea, onions, or anything at all in the shape of luxuries to be had anywhere from the merchants. It is a town of about 450 mud houses, and I should estimate about 2500 to 2750 inhabitants, certainly not many more, and I agree with Mr. Wilfrid Blunt in his opinion that Palgrave very much over-estimates the number of the inhabitants when he puts the population of El Jauf and Skaka down as 40,000, while Mr. Forder says he was told, when there, that there were 40,000 people in El Jauf alone.

The houses, as at Skaka, are well-built mud houses, some of them with two storeys. At El Jauf, as at Skaka, the great pride of the inhabitants is the date, and with reason, as they are big and luscious, and famed as being the best in North Arabia. The chief industry is the weaving of "abbas," saddlebags, and headstalls for camels, and the manufacture of swords. At Skaka, also, they weave excellent "abbas." These "abbas" are famed from Baghdad to Damascus.

The water at El Jauf is excellent, there being six springs and many wells, and the inhabitants told us that the water from these springs was cold in summer and warm in winter. It certainly was warm in winter, but for the truth as to its being cold in summer I cannot vouch. Maarid, the old castle round which most of the houses cluster, although thought much of by the inhabitants, does not strike one as being anything at all wonderful. It is now in ruins, and, I should think, was built some six hundred years ago.

The complexion of the people from Hail is lighter than that of the men from El Jauf. The inhabitants proved themselves to be a hardy race in the past, and have given considerable trouble to the Sultan at Hail; but now, however, they appear to be a most law-abiding people, and pay taxes to Ibn Rashid without the least demur. The taxes are one real for every ten sheep or goats, one real for every five camels, six reals for every bale of merchandise brought into the town by merchants, one real on every camel sold, and tithes in kind on all dates and crops. After considerable difficulty we managed, with the emir's sanction, to get a man who said he would take us to Sham (Damascus, that Elysium of the Beduin), and so, on the morning of the fifth day after our arrival in El Jauf, having bid farewell to Feysul, and got letters of introduction from him to the Druses of Jebel Hauran, we set out once more, with our guide Habeeb, our servant Abbas, and a youth called Haamed, who insisted on attaching himself to us, although we told him we did not want him. For the first three

days after getting away from the hollow of El Jauf we travelled over a big rolling steppe, with flinty soil, covered with short scrub and occasional belts of sand and low sandhills. We followed the line of the wadi Sirhan, but kept for the most part a bit to the east of the line of wells. There is water all the way from El Jauf to Damascus, as there is a continuous line of wells from Magua, 15 miles north-west of El Jauf, every few hours right up to Gasr Azrag, where water can be obtained even in the summer—at least so we were informed by our guides, and once at Gasr Azrag you are practically on Jebel Hauran, where water is plentiful.

On the afternoon of the third day out from El Jauf we came to the

INTERIOR OF CASTLE AT MAARID.

wells of Abu Gasr, where we found some Roalah watering a large number of camels. They were from the Roalah under Ibn Sheilan, the most powerful of the Roalah sheiks, who, they informed us, had his tents about two days to the east of us. As there is now peace between Ibn Rashid and Ibn Sheilan, and our guide was a man of Feysul Ibn Rashid, we were civilly treated by the Roalah. The following evening, near Wadi El Aily, we came across another party of Roalah, with whom we camped, and owing to the heavy rain, which made going for the camels impossible, we were forced to spend the following day with them also. They treated us with the very greatest hospitality, erecting our shelter for us in the pouring rain, and supplying us liberally with camels' meat, milk, and firewood. There was not a great number

of them, and we only saw about thirty tents. They had no sheep or goats with them, only camels.

As we reached our camp at El Aily, the formation of the country changed, the rolling steppe and sandy and flinty soil giving place to hilly country covered with black basaltic rocks. On our journey we saw no signs of volcanic formation south of El Aily. The country continues very hilly from here, right up to Jebel Hauran with the exception of the part between Kaf and Gasr Azrag, which (after the first 10 miles or so out of Kaf, which is hilly) is just a flat, level plain covered with short herbage. The two biggest hills we saw between El Aily and Jebel Hauran were Jabel El Shedad, so called from its likeness to a camel's riding-saddle, and Jebel Misma, which is a little way north of it, and a hill about 20 miles long and 200 to 250 feet high in some parts. Near Jebel El Shedad we also passed within a mile or so of a sea of quicksand called Nugrat El Huthatha, that looked white and shimmering in the sun. It is about 10 miles square, and our guides said that nothing can cross over it, and a stone thrown on to it will at once sink out of sight.

Eight days after leaving El Jauf we arrived at the Bilaydat, a group of small villages that mark the northern limit of the authority of Ibn Rashid. They are called respectively, Gurr-Gurr, Guti, Jilleeb-Tullal, Wush-Wash, Ethra, Minwar, Kaf, Um-El-Jiran. With the exception of Kaf, which consists of about 400 people, and Ethra, of which the population is about 100, these villages are nothing much more than a mud fort, some date palms, a spring or so, and about ten people. The water at Kaf is very sulphurous, and not at all pleasant to drink, and causes bad headaches and diarrhœa to those not accustomed to it, and fever to the inhabitants in summer. There are the remains of an old Saracenic castle called Gasr-Seyidi on a hill, about 400 feet high, overlooking the town, and there are also large salt deposits round Kaf, the salt from which the inhabitants collect, and sell to the neighbouring Beduin. At Gasr Azrag also there is an old Saracenic ruin, but it is in much better repair than the one Kaf, and when we spent the night there, was inhabited by a murderous-looking crew of Arabs, who hold it for the Druses. They treated us very well, however, and did their best to make our stay there comfortable. The headman of the place told us he had only been there a couple of months, and his first job had been to cut down the remains of his predecessor, which had been hanging over the door many weeks, he having murdered a companion there, and, as a punishment, had himself been hung over his own doorway by the Druses, to whom the murdered man's son had appealed for vengeance. From Gasr Azrag to the Druses it only took us two days. We were all the time ascending Jebel Hauran, and spent the night with the Ahl El Jebel. These people, our guides told us, were horrible thieves and robbers, but they entertained us with the greatest kindness. They are

Beduin, but closely related to the Druses, and frequent the southern slopes of the mountain. They have many sheep and goats, but few camels. The women here came and sat round the fire with the men, and drank coffee and smoked long wooden pipes (kundara).

It is not necessary for me to go into any detailed description of the Druses, as they and their country are well known. We were received well, in fact, effusively, as the English, who have helped them in times past, are very popular with them. At first, when we were mistaken for Turks, our reception was somewhat chilly, but when they found out that we were English they could not do enough for us. The biggest sheik of the Druses is Mustapha El-Attrash, commonly called Abu-Ali. We stopped a night at his village, and he entertained us in first-rate style. The next night we spent at the village of Selim-El-Attrash, who also treated us very well. The latter is a somewhat turbulent gentleman, and is always giving trouble to the Turkish authorities.

The Druses' houses are well built, of black basaltic rocks. Two days to the west of the village of Selim-El-Attrash we struck the railway, some 60 miles south of Damascus. Here we left our camels to come on with our servants and guides, and went on by a native train in a goods van full of Arabs, Turks, and Syrians, arriving at Damascus on February 25. As regards animal and bird life between El Jauf and Jebel Hauran, we did not see so many gazelle as we did between Kabweisa and El Jauf, but we saw the tracks of ibex near Jebel Mismah, and of ostrich in the Aily district. We put up quite a lot of sand-grouse and lesser bustard, and sometimes a partridge, but, on the whole, did not see so many birds as we did on the first half of our journey.

While at El Jauf we got, from Feysul Ibn Rashid, two pairs of horns of the Arabian oryx, which we brought home with us. They are not so long as the African oryx horns.

I should like to add that I have written this as much from Captain Aylmer's notes as from my own, and to express my gratitude to him for letting me so use them, and also publish the map made by him from our notes taken on the journey. I should also like to take this opportunity of thanking the many kind friends who entertained and helped us on our journey.

After the paper, Mr. HOGARTH: We have had the pleasure of listening to a singularly straightforward and convincing account of a journey, part of which has not only not been done before, but, so far as I know, has not been attempted. And although other travellers have been at El Jauf before, no one has shown a series of photographs of the place, either in this hall or anywhere in this country, and I think it reflects very great credit on the travellers indeed that they were able to bring back any photographs at all. It is very often said that there is very little to see in Arabia—Arabia is very much the same everywhere; but I think you will agree that whatever was to be seen on that journey, Captain

Butler has seen it, and he certainly has wiped one white spot off the map. One of the most interesting things to me was his short account of that very interesting people, the Sleyb. I do not know that I have any very well-founded theory as to the racial origin of the Sleyb. In their habit of life and their relative position to other tribes, they answer to our gipsies. They are not the least cofinned to the region in which Captain Butler saw them, but are to be found in very small parties, and sometimes singly, over a very wide area. It is possible that they belong to a stock which was in Arabia before the Semites appeared. Most of the tribes among whom these plucky Englishmen travelled are known to have come there in comparatively recent times, when the Turkish rule was weak, in about the end of the sixteenth or the beginning of the seventeenth century. There was then a great movement which has left its results in the present Anazeh, who range over the whole so-called Syrian desert, and the Shammar, who range over mid-Mesopotamia. It is also very interesting to have a recent account of El Jauf. I always think the most remarkable thing about the place is that it is in the hands of the Shammar at all, whose centre is so far away in Arabia proper, on the other side of that very terrible desert. Captain Butler said some hard things about the way in which the members of the Rashid dynasty have come to the throne. It is perfectly true that what has been done by its latest members has been done all through the history of the family. But, after all, what has any Eastern sultan done? One hundred years ago the same was done in Constantinople. I should not score it very heavily against the Rashid family, considering how far away they are from civilization, that they still maintain that well-established Eastern custom. In other ways they are a very interesting family. The sultans of Hail form the most purely Bedawi power that exists, and it is curious that with the very small organized force that they have at their command, they are able to maintain control over such an enormous region. It shows how a little organization makes the whole of the difference, and I think explains a good deal in the early history of Islam—the extraordinary effect which very small forces produced in the history of Arabia. I do not know that I have very much more to say upon this subject. I believe that Fortune's wheel has taken yet another turn, and that the Sultan of Hail has come uppermost again within the last two or three months. He is bound in the end to have the upper hand in Arabia, until some better organized force, whether Turkish or another, is really able to invade his country. Turkey has always had a certain hold over the Rashid family at Hail, and the Ottoman sultan's name has always been included in the public prayers. I have only to express for myself the very great interest with which I have listened to this paper, and repeat what I said at the beginning, that it is very seldom one listens to so straightforward and convincing an account of a journey which needed not only considerable pluck, but considerable endurance.

Colonel MAUNSELL: I should like to congratulate the lecturer on filling up another white blank on the map of Arabia. By his journey he has completed the line from Maan, on the extreme left of the map, across to Baghdad. He did not take the exact straight line between Jauf and Nejef, still he explored the country only slightly to the north of it, and confirmed what Huber has already told us about El Udian as a country with a fair supply of water, and consequently of a certain relative fertility. I should like to ask him if he found any traces of ancient communication between Egypt and Syria following a route from Nejef through El Jauf to Cairo? There must have been some communication between the ancient empires of Egypt and Assyria, and it probably followed the straightest road through El Jauf. It is quite possible that as railways have been made through the equally desert and inhospitable country of the Hejaz, a communication might be made between Cairo and Baghdad connecting the two fertile countries of Egypt and Mesopotamia.

Captain BUTLER: Between Nejef and El Jauf there is a distinct line of communication and wells, but from El Jauf to Maan, although Beduin sometimes traverse that route, there is, I think, no distinct line of communication.

Colonel C. E. YATE: I had the pleasure of hearing Mr. Drummond Black's lecture the other day at the Central Asian Society on his proposed line of railway across northern Arabia from Suez to Busrah; and he has also published an article on the same subject in the *Nineteenth Century*—a line running approximately along the 30th degree of latitude marked on the map before us. I shall be glad if the lecturer will kindly tell us whether he thinks it will be possible to construct a railway along that line. Will there be any high mountains or hilly country, deep wadis or steep escarpments to be crossed, and, in fact, will the construction of a railway line there be a matter of difficulty or not?

Captain BUTLER: I think the chief difficulty in a railway line of that sort would not be so much from the country, the obstacles of which, I think, could be overcome by clever engineers; but the great difficulty would be safeguarding the line across that enormous extent of country from the raiding tribes of the Beduin, and until either Turkey or some other power has established a firm hold in Arabia, I do not see how it could possibly be done. Water would have to be carried by the train itself, as I understand it is on the Hejaz railway.

Mr. HOGARTH: Would water have to be carried the whole range?

Captain BUTLER: No, because all along the line there are certain wells which the railway could touch, and the existing wells would be improved.

The PRESIDENT: This expedition might serve as an example to other explorers, especially in two respects. It might serve as a reminder to English officers serving in distant parts of the world of the admirable opportunities they have when going on leave of exploring some hitherto unknown part of the world. Such expeditions, to be useful, must be made, however, with a knowledge of how to record what is seen, and in this case I think Captain Butler and Captain Aylmer did as good work as the circumstances permitted in the way of bringing back maps, and their photographs are admirable. This journey illustrates another point, and that is what wonders can be done by courage, firmness, and tact in keeping on good terms with the natives. It is very remarkable the way in which these officers seemed to make friends with all the natives they met with. Even as regards the ruler of El Jauf, Captain Butler speaks of him with a certain kindly feeling, notwithstanding the outrageous way in which he was fleeced by him, and I cannot help thinking that this local chieftain, if he be alive, if he were here to-night, would take pleasure in joining with all in expressing our thanks to Captain Butler for the extremely picturesque way he has described his atrocities.

THE COLORADO CANYON—SOME OF ITS LESSONS.*

By Prof. W. M. DAVIS, of Harvard University.

THE Colorado canyon, deeply eroded by the Colorado river in the arid plateaus of northern Arizona, was first scientifically described by Newbery fifty years ago; ten years later it was explored by Powell in

* Summary of lecture at the Royal Geographical Society, March 22, 1909.

his famous expedition down the river in boats; since then it has been elaborately described by Dutton and impressively pictured by Holmes in the second monograph of the United States Geological Survey; it is now accessible by rail in four days from New York, and is annually seen by many thousand visitors. Most of these visitors still fancy that the canyon was first suddenly formed as a huge fracture, through which the river then took its course; but there is absolutely no evidence that such is the case. A number of fractures do traverse the plateau district from north to south, but the river, flowing from east to west, pays no attention to them. The canyon is purely the work of normal erosion. When the visitor is assured of this, his first thought is that the river has done an enormous piece of work in eroding so huge a canyon. Truly the erosion of a canyon is a great work, and yet it is only a respectable beginning of the work upon which the river has entered. When the visitor is told that the completion of this work involves the slow erosion of the vast mass of the plateaus north and south of the canyon, he becomes incredulous. When it is sought to explain that so great an amount of erosion has already repeatedly taken place in the Earth's history, and that some geographers propose to make use of what has been learned about erosion, by describing all land-forms in terms of the stage that they have now reached in the entire cycle of erosion upon which they have entered, the visitor is inclined to regard such a method of geographical description as too fanciful for practical application.

Nevertheless, if a visitor of ordinary intelligence, though without technical training in geology or geography, after looking attentively at the rock structures displayed in the canyon walls, and at the plateau forms north and south of the canyon, will but listen patiently to the explanations that have been found for what may there be seen, he must be convinced that the enormous work already done by ordinary erosional processes is only a good beginning of a far greater task, and in the end he must be satisfied that the description of all land-forms in terms of the stage that they have now reached in their cycle of erosion is not only feasible but effective. He will at the same time learn a lesson that is most valuable to all geographers, namely, that the present epoch of Earth history, with which geographers deal, is merely the latest epoch added to a long series of very similar preceding epochs; that geography is only the to-day that follows the yesterday and the many earlier days of geological reckoning; and that the contrasts which characterized the older-fashioned study of geography and geology are, in the modern understanding of Earth science, largely replaced by resemblances.

The first lesson to be learned during a visit to the canyon is, therefore, the efficacy of ordinary erosional processes of the present day, even in the dry climate of the plateau region. When this fact of

observation is appreciated, the geographer must use his imagination as to past and future erosional work. He must first recognize that the main canyon, 100 miles long and nearly a mile deep, and its innumerable side canyons, have been carved in the plateau by the main river and its wet-weather branches. He must then strive to realize that the indefinitely long continuation of these processes will eventually consume the entire plateau, and reduce it to a nearly featureless lowland, but little over sea-level. He must open his mind to the conception of these possibilities, which are logically based on the long continuation of present conditions in the past and the future. He is then really prepared to apprehend that the canyon, as we see it to-day, is simply a modest beginning in the vast task that nature has assigned to the Colorado river—the task of cutting down its channel, and of receiving and carrying away to the sea all the rock waste weathered and washed from the plateaus, until the plateaus are worn down to lowlands. Great as the canyon is, it is only a young valley. Vast as may be the work already accomplished by the energetic river, this work is only a fair beginning in the enormous task that the river has undertaken.

It is not to be wondered at, if a beginner in Earth science finds it difficult to imagine the actual accomplishment of so great a task as the removal of the broad plateaus by the slow processes of weathering and washing. Even Colonel Greenwood, who sixty years ago attributed so much work to rain and rivers, did not venture to state so extreme a conclusion that, after the valleys are carved, the hills must be worn away. True, Ramsay had somewhat earlier perceived that the long-continued action of seashore waves, supplementing the action of subaërial erosion, would eventually produce a "plain of marine erosion;" but it was the American explorer and geologist, Powell, who first brought forward the view that a plain of erosion may be produced without the aid of marine processes; and the very facts which led Powell to this view are seen in the walls of the Colorado canyon. Let us therefore look at the structure of the plateau as it is revealed in this great natural section.

In the eastern part of the canyon, where the altitude of the plateau is of moderate measure, the entire depth of the canyon is cut through a series of horizontal strata, which we may call the plateau series. Further west, where the plateau is higher and the canyon is deeper, the strata of the plateau series are seen to rest on an even foundation of crystalline rocks. Hence the history of the plateau may be treated in two chapters. Between these two localities, a series of slanting strata, inclined to the eastward with a dip of about 20°, lies between the crystalline foundation and the plateau series; these inclined strata may be called the "wedge series," because they seem to be wedged in between the other two rock series; thus it is perceived that the

history of the plateau may be divided into three chapters, each of which has been occupied in making a member of the rock series.

By descending to the canyon bottom, the contact surface, where the slanting wedge series lies in the slanting crytalline floor, may be examined. The first conclusion there gained is, that the present slanting separation surface of these structures must have been horizontal at the time of the deposition of the wedge series. The second conclusion is that the crystalline floor, a remarkably even surface, must have existed as such before the deposition of the first member of the wedge series. What was the origin of the level-topped crystalline mass?

Crystalline rocks cannot be formed on the land surface or at the sea bottom; they originate at a significant depth beneath the surface, under conditions of high temperature, great pressure, and long time. The structures of this crystalline mass are varied, and have not yet been studied in detail; but it cannot be doubted that the first chapter of the history of the region, in which these ancient rocks were formed, was a very long chapter.

If the crystalline rocks were formed at a considerable depth in the Earth's crust, the overlying parts must have been removed by erosion in order to lay bare the deeper parts. Hence we perceive that a chapter of erosional work must be interpolated between the making of the crystalline rocks and the deposition of the wedge series. The crystalline floor on which this deposition took place is remarkably even; hence during this interpolated chapter, an entire cycle of erosion must have run its course; and such a cycle is a vastly longer period of time than that required to erode a mere canyon. A canyon represents a good beginning in a cycle of erosion; a floor of crystalline rocks, worn down to a plain, represents the actual attainment of the end of a cycle of erosion. And only after this long-delayed end was attained did the deposition of the wedge series begin.

The deposition of the wedge series, the third chapter in the history of the region, implies slow depression (and presumable submergence) of the worn-down crystalline mass, and the erosion elsewhere of the materials here deposited. The wedge series is about 2 miles thick, and although part of it consists of ancient lavas, its sedimentary content is enormous. To supply so much material by the erosion of some neighbouring area must have again required a long period of time.

Then came the tilting of the wedge series and the underlying crystalline rocks, and the erosion of the tilted mass until it was worn down to the even surface which now transects both the crystalline rocks and the wedge series. Here again a new chapter, the fourth in the history of the region, must be interpolated between the making of the wedge series and the making of the plateau series; and, like the previous chapters, this one must have been enormously long, because it again witnessed the essential completion of a cycle of erosion.

Then, in a long fifth chapter, came the slow depression and submergence of the worn-down mass, and the deposition of the plateau series. Its lower members are of Cambrian date; its upper members are Carboniferous. Hence it would seem as if the erosion of the canyon had occupied the time from the Carboniferous period to the present; but this is far from being the case.

If we now travel northward across the plateaus, we shall find at a distance of 50 or more miles a series of south-facing cliffs, where one may gradually ascend by a succession of great steps to the high plateaus of Utah. Here is a heavy series of strata, from Permian to Eocene in date, and all in essentially conformable sequence, with a gentle inclination to the north; and there is good reason for believing that these strata once stretched far southward across the Arizona plateaus, even beyond where the canyon is now eroded. The deposition of this uppermost series required a sixth chapter, and its removal from the Arizona plateaus a seventh chapter, each of which must have been vastly longer than the time required for the erosion of the canyon; and only after the seventh chapter was far advanced was the region elevated to its present altitude, and the erosion of the canyon begun.

What, then, are the lessons of the canyon? Not simply that it is a grand example of patient work, but that as a consequence of its erosion, the deep structure of the plateau is revealed, and that this structure proves to us the long continuity of processes like those of to-day through many chapters of past time, each of which was much longer than the few pages required for the erosion of the canyon; not simply that these processes have acted through long-past ages, but that some understanding of them is essential for an appreciation of the present; not simply that the canyon is the work of normal erosion, but that the canyon may reasonably be described as a young valley, as the work of normal processes during the early part of a cycle of erosion, which, if continued, will witness the reduction of the plateaus to lowlands, similar to the lowlands of erosion that were produced in the second, fourth, and seventh chapters of the region's history. There is, therefore, nothing unwarranted in the use of an explanatory description for land-forms, in terms of the stage that they have reached in the cycle of erosion upon which they have entered. Such a method of description simply makes use of the well-attested occurrences in Earth history as a means of describing its present condition.

The PRESIDENT (before the paper): The lecturer whom we welcome here to-night is Prof. Davis of Harvard University—a university in which I think we have a special interest, as it was founded by a Londoner. Prof. Davis has, I think, done more than any man on either side of the water to raise the standard of the teaching of geography in the direction of making it a more definite science. I am sure, after you have heard his lecture to-night, you will not be surprised to know that his

teaching is of a peculiar stimulating nature, and that amongst his pupils there are many who have already won considerable distinction in geography. I may perhaps mention the name of Dr. Ellsworth Huntington, who wrote the 'Pulse of Asia,' and who has lectured to us here. We owe to the system of exchanges of Chairs between Harvard University and Berlin the pleasure of the visit to-night of Prof. Davis, because he is on his way back from having fulfilled his duties in Berlin, having made such an exchange with a German professor. I cannot help hoping that this system of exchanges of Chairs which exists between Harvard and Prussia may find an echo in this country, and that at some future time we may frequently welcome American professors, not only as our guests, but as our teachers.

The PRESIDENT (after the paper): I think we shall all carry away a considerable number of vivid memories of to-night's lecture. We shall all retain recollections of the extraordinary beauty of the scenery of this Colorado valley, and of the admirable way it has been illustrated. But I believe there are other and more permanent memories which will remain in our minds. Every one who has ever looked at a bit of scenery and had in his mind at the time a knowledge of the geological formation of the country, must have been struck with the way the interest of the scene is thus enhanced. I take it that our lecturer to-night has wished to indicate to us that by teaching the origin of land-formation we arrive at far the best method of geographical description. He has, in fact, without our knowing it, been giving us a lecture on the best form of geographical teaching; and I am sure I may express your wishes that many other such lectures may be given us, affording educational instruction in such a pleasing manner.

LEONARDO DA VINCI AND THE ART OF THE RENAISSANCE IN ITS RELATIONS TO GEOGRAPHY.*

By Prof. Dr. **EUGEN OBERHUMMER** (Vienna).

I.—INTRODUCTION.

TWICE before the development of modern science commenced has geography made an immense stride which threw all earlier investigations into the shade and far surpassed the following age in the extent of its achievements. The first period of progress is marked by the geography of the Greeks, which, starting from the part of the Earth's surface then known, determined with wonderful ingenuity the form and dimensions of our planet, gained an insight into its position in the solar system, and established for all time the outlines of mathematical geography. The second period was when Europeans, throwing off the fetters of the mediæval conception of the world, boldly stretched their hands over the ocean, and in a victorious career of one century (about 1420–1520) closed a ring around the world, the surface of which had hitherto been revealed slowly and step by step. While now for the first time the continents and oceans were exhibited in their actual forms, and their graphic representation was soon completed, the flood of new facts led to an extension of the knowledge of the Earth which supplemented

* Map, p. 628. Fig. 1 is copied from *Archæologia*, vol. 40, p. 1, by permission of the Society of Antiquaries; figs. 2 to 6 from Richter's 'Leonardo da Vinci,' by permission of Messrs. Sampson Low & Co.

in the happiest manner the acquisitions of the Greeks, and bore fruit in the brilliant researches of Copernicus, Mercator, Galileo, Kepler, Varenius, and Newton. That unique epoch, standing out conspicuously in the history of human culture, which we call the Renaissance, began with the sprouting out anew of the seeds of old Greek thought; it inspired imitative art with new life and, developing harmoniously all its branches, raised it to a height it has never subsequently attained; in the New Learning it handed over the intellectual treasures of the ancient world to the modern, and in the art of printing provided the nations with the most ample means for the exchange of their ideas; in the Reformation it broke through the bonds that had hampered thought and research for a thousand years, and introduced a new era in all departments of human science.

Except archæology and astronomy, no branch of knowledge was so promoted and revolutionized by the Renaissance as Earth knowledge. Not a few modern geographers, whose names are among the most noted in our profession, have therefore rightly devoted a large, nay, the largest part of their life's work to the investigation of that period of geography. I need only mention the names of Alexander von Humboldt, Oskar Peschel, Sophus Ruge, Baron Nordenskiöld, Henry Harrisse, Franz von Wieser, Hermann Wagner, Konrad Kretschmer, Gabriel Marcel, Lucien Gallois, etc., or refer to the services of the Hakluyt Society and similar institutions, in bringing to light the geographical achievements of the Renaissance period.

Our colleague, Siegmund Günther, in a valuable lecture before the Geographical Congress in Berlin, illustrated the influence of learning on the development of geography.* In this connection I should like to refer, rather in general terms than in a special disquisition, to the manifold relations connecting Earth knowledge with the art and artists of the Renaissance. In that time not only the most diverse branches of research in history and natural science were often studied by the same person, but also were with structural and imitative art combined in a harmony impossible under present conditions. I place in the forefront a personality, known to the general public only as one of the great Italian masters of painting and the plastic arts, because hardly any other represents the wonderful versatility of the leading minds of that age as Leonardo da Vinci does, and because several recent publications have made known to us Leonardo's life-work from our standpoint as geographers, though the influence of the great Italian on our science is not yet fully known to the friends of geography. For as Leonardo's artistic remains reveal to us only a fraction of his learning and achievements, on which art criticism has not by any means uttered the last word, so his literary works have come to light by degrees and not completely

* *Verhandl. d. VII. intern. Geographenkongresses*, vol. 2, pp. 845 *et seq.*

even yet. The manuscripts of his works are scattered through the various libraries of Europe, especially in Italy, France, and England, and are, moreover, hard to decipher, for Leonardo wrote from right to left. They are mostly hasty memoranda for personal use and not for publication. Like many of his artistic studies and designs, these notes are of an aphoristic character, and seldom form a connected

FIG. 1.—NORTHERN HEMISPHERE OF THE MAPPEMONDE.

(*After R. H. Major.*)

composition of any length. The character of this irregular sequence of ideas, draughts, and sketches may be observed in the 'Codice Atlantico' in the Biblioteca Ambrosiana, Milan, now to be obtained in facsimile,* as well as in the voluminous collection of the Paris manuscripts published by Ravaisson-Mollien.†

* 'Il Codice Atlantico di Leonardo da Vinci nella Biblioteca Ambrosiana riprodotto e publicato dalla R. Accademia dei Lincei,' 4 vols., fol. Milano: 1894–1904.

† Paris, 1880 *et seq.* A new edition of the London and Windsor manuscripts published since 1901 in Paris, and calculated to form a collection of forty-one volumes, is not accessible to me in Vienna.

II.—Leonardo as Cartographer.

Some parts of Leonardo's writings have long been known, and their valuable contents soon attracted the attention of scientific circles. As early as the end of the eighteenth century the Italian physicist, T. B. Venturi, published an essay on the studies of the artist in mathematical physics,* which caused Peschel to assign to Leonardo a prominent place in the history of geography.† Historians of the physical sciences have made many further contributions to the subject; but they deal chiefly with details only, and do not exhibit the versatility of the master even in this domain.‡ The sketch of a map of the world in a collection of manuscript notes of Leonardo now in Windsor Castle excited especial notice in geographical circles. It is a rough sketch for a globe, not in the usual form of gores, but in sectors, four for each of the northern and southern hemispheres. Particularly noticeable is a southern land corresponding to our Antarctic continent, which is separated from Africa and America by broad belts of sea. The first editor, R. H. Major,§ assigned the map to the years 1513–14, and believed it to be the oldest map containing the name America. After him A. E. Nordenskiöld ‖ issued a reduced facsimile, and F. von Wieser ¶ the western hemisphere within the usual border of a planiglobe, in which form K. Kretschmer ** also has reproduced the map. Wieser, who dates the map somewhat later (1515–16), recognizes it as the type of the maps of the world on which Magellan based his plans for a south-western passage. The southern continent being placed at a considerable distance from Africa and America, this sketch has no little interest in spite of its roughness and lack of detail, though the use of the name America has lost its importance since the discovery of Waldseemüller's great map of 1507 and its later imitations. Another question is whether Leonardo was its real author. Italian experts, as the Marchese Girolamo d'Adda †† and G. Giovi,‡‡ have decided in the negative, likewise the best authority on early American maps, H. Harrisse,§§ while M. Fiorini ‖‖ maintains its authenticity, and even if the actual drawing is Leonardo's, the map

* 'Essai sur les Ouvrages physico-mathématiques de Léonard de Vinci.' Paris: 1797.

† *Geschichte der Erdkunde*, 2 Aufl., 1877, s. 427, 438.

‡ See S. Günther, *Geschichte der Erdkunde*, 1904, pp. 113, 118 *et seq.*, and the works referred to there.

§ "Memoir on a Mappemond by Leonardo da Vinci," *Archæologia* (1866), vol. 40, pp. 1–40, pl. i. and ii.

‖ 'Facsimile Atlas,' p. 77.

¶ 'Magalhâesstrasse u. Australcontinent' (1881), pp. 52–58, pl. iii.

** 'Die Entdeckung Amerikas' (1892), pp. 389 *et seq.*, pl. xi.

†† 'Leonardo da Vinci e la Cosmografia.' La Perseveranza, Milano: 1870.

‡‡ 'Saggio delle opere di Leonardo da Vinci,' p. 12. Milano: 1872.

§§ See E. Müntz, 'Léonard de Vinci,' pp. 353 *et seq.*

‖‖ "Il Mappamondo di Leonardo da Vinci," *Riv. geogr. ital.* (1894), vol. 1, pp. 213–23.

may, in Wieser's opinion, be only a copy at third or fourth hand and not an original design of the master.*

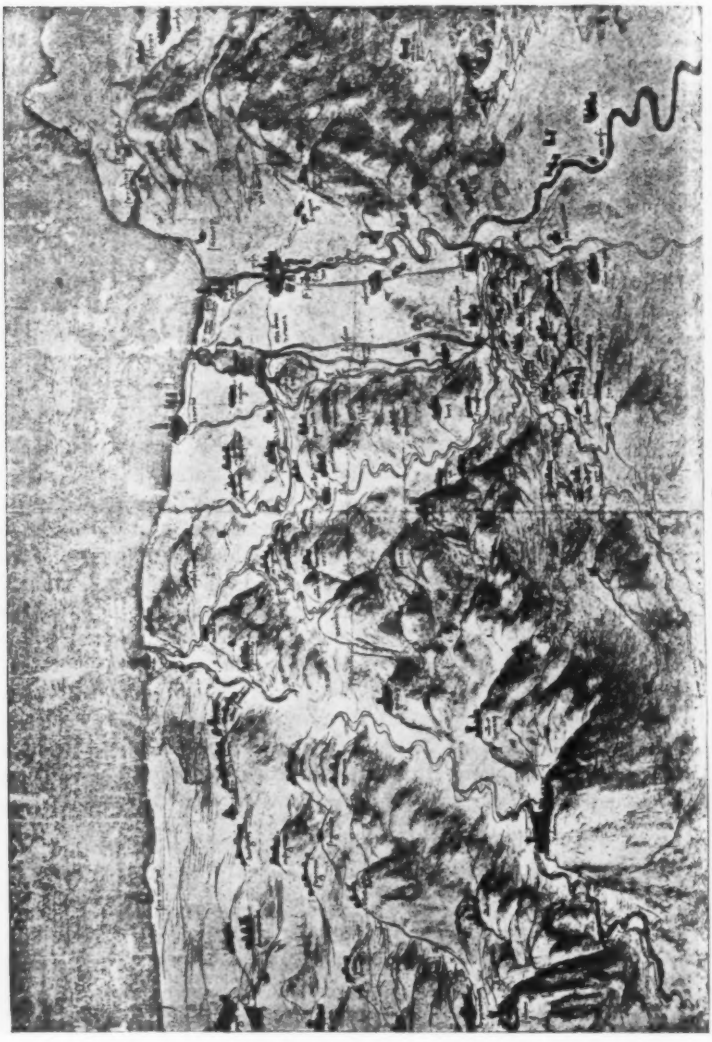

FIG. 2.—MAP OF NORTH-WESTERN TUSCANY.

* The map is also reproduced by Winsor, 'Hist. of America,' vol. 2, 126, and is discussed by H. Harrisse, 'Disc. of N. America,' p. 504, and S. Ruge, 'Entwickelung der Kartographie von Amerika,' pp. 43 *et seq.*

Fortunately our knowledge of Leonardo's geographical work is not confined to this sorry sketch of doubtful origin. Jean Paul Richter *

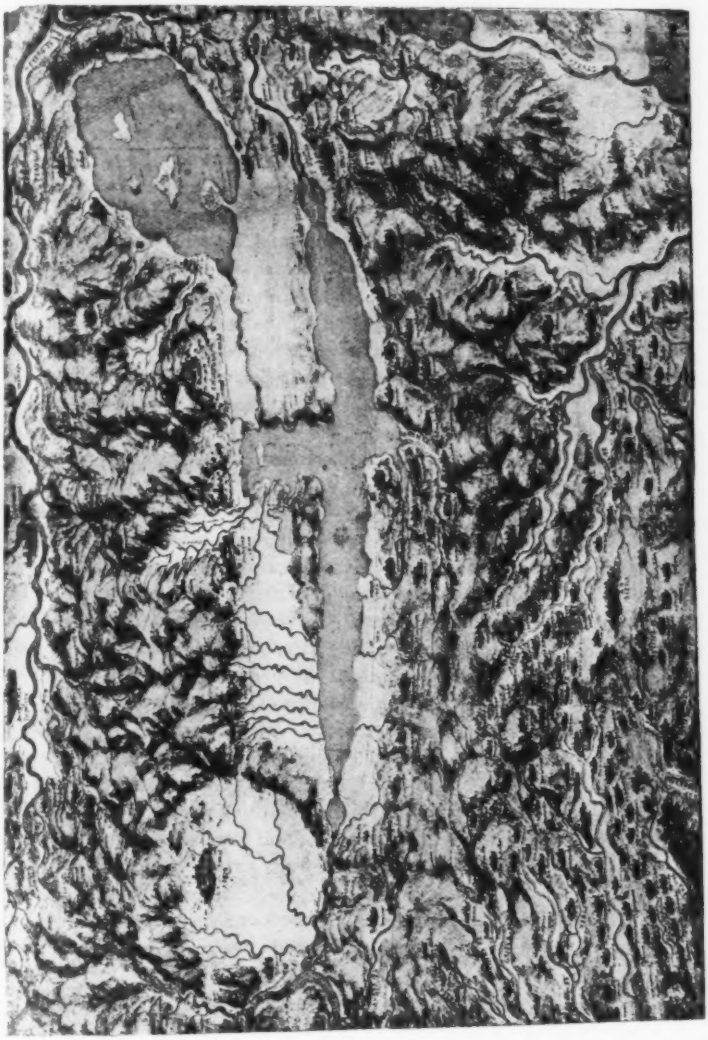

FIG. 3.—MAP OF EASTERN TUSCANY.
(*After T. P. Richter.*)

has brought within our reach a large number of map drawings preserved

* 'The Literary Works of Leonardo da Vinci,' vol. 2. London, 1883.

in manuscript, which, however, are hardly known in geographical circles. Other material is contained in the monumental work of the Accademia dei Lincei, edited with exemplary care and recently published, the 'Codice Atlantico.' Most of these maps owe their origin to a tour of the artist through central Italy in 1502. They are not copies but detailed surveys freely traced on the spot; some sketches hastily thrown together; others carefully executed in colour with pen and brush. To the latter belong three maps in the royal library at Windsor, one of which represents north-western Tuscany from the coast near Leghorn to Lucca and Volterra, a country with which the artist, who was born at Vinci near Empoli, was particularly well acquainted. The scale is approximately 1 : 300,000, the orientation is towards the west. The sea is blue, the land is coloured in sepia-brown, and the mountains, mostly crowned by towns, are drawn in perspective, with the light falling from the left (south). Rivers are indicated by double lines, towns and villages by vignettes. The second map is similarly executed and embraces eastern Tuscany between Arezzo, Siena, and Perugia. The scale is about the same, but the orientation is to the east, and the light falls from the right (south). Besides the blue expanse of the lake Trasimeno with its three rather exaggerated islands, we notice in the Valle di Chiana a large and long sheet of water, no longer existing, which drains both to the Arno and the Tiber. The third of the maps made known by Richter* represents the southern part of the Pontine marshes with Monte Circeo and the mountains of Terracina. The scale is at least double that of the maps already mentioned, but, as in them, not uniform throughout. The curves of flexure in the low flood-land coast are too much rounded, as they appear to the naked eye, the mountains (with the light falling from the left), the swamps, and especially the thickets on the sandhills are very naturally drawn. The orientation is to the north-east. All three maps afford remarkable examples of detailed surveys as they were known in Italy in the fifteenth century, but are seldom found elsewhere at that time.

Not less worthy of remark is a carefully executed plan of the town of Imola in the Romagna, also in the royal library at Windsor.† The representation of the walls, streets, wards, and even single buildings, as, for instance, the cathedral and the castle, is in strict geometrical outline; outside the town the roads, fields, and the Santerno flowing between banks of detritus, are recognizable. The plan is exactly oriented by a windrose, and on its eight radii one reads in mirror-writing *septentrio*, *grecho*, *levante*, *scirocho*, *libeccio*, *ponente*, *maestro*. The position of the town with respect to neighbouring places is set down in a note,‡ "*Imola*

* *L.c.*, pl. cxii.-cxiv. The first of these three maps has also been reproduced in colours in the splendid work of Eug. Müntz, 'Léonard de Vinci,' p. 352. Paris: 1899.

† Richter, pl. cxi.

‡ Ibid., pp. 243 n., 1051.

vede Bologna a $\frac{5}{8}$ *di ponente inverso maestro* (five points from the west towards the north-west) *con distantia di miglia* 20," etc. Similarly, the position with respect to Castel S. Pietro, Faenza, Forli, Forlimpopoli, and Bertinoro, is fixed by direction and distance—an interesting specimen from the childhood of cartographical survey.

The survey of Imola is only one of a series of works which Leonardo executed for Cesare Borgia. In 1499 Cesare had conquered the Romagna and taken the principality of Urbino. In 1502 Leonardo entered his service as a constructor of fortresses and military engineer. It is proved that after July, 1502, he was in Urbino, Pesaro, Rimini, Cesena, and other places, everywhere drawing plans and instituting surveys.* Probably the three maps of Tuscany were also intended for Cesare's personal use, and therefore the text is not in mirror writing. The careful style of execution based on studies and sketches still preserved in manuscript also points to the same conclusion. The death of Pope Alexander VI. (1503), and the consequent fall of the Borgias, may have prevented the maps from reaching their original destination.

The rest of the maps and plans left by Leonardo in manuscript bear generally the character of hastily drawn sketches for his own use, as that of Milan † (ground plan and elevation), maps of the lakes of Lecco, Annone, and Pusiano,‡ various river courses, particularly of the Loire, near Amboise above Tours, with the large islands which curb the current,§ and lastly perspective drawings of the Armenian mountains.‖ That the last were not drawn, as Richter ¶ assumes, during a tour of the artist in the East, but are based on information derived from others, has been demonstrated by Douglas Freshfield,** G. Uzielli,†† and others.‡‡ On the other hand, the notes and observations on the Loire are explained by his appointment as court painter to Louis XII. (1503), and his sojourn in a chateau near Amboise (1516–19), which Francis I. assigned to him as a place of residence. §§

Neither the frequently discussed map of the world, of which probably we should reject him as the author, nor the hastily drawn outlines of the eastern hemisphere, put together in the geographical style of the

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* A. Rosenberg, 'Leonardo da Vinci,' 2 Aufl., 1907, p. 88; Richter, *l.c.*, p. 224.

† Richter, *l.c.*, pl. cix. (from the 'Cod. Atl.').

‡ 'Codice Atlantico,' vol. 2, fol. 275: "*Il lago di Pusian versa nel lago di Serio, ed Annon e di Sala.*"

§ Richter, *l.c.*, pl. cxv., p. 251 (Arundel MS. in the British Museum). Other hydrographical sketches, *ib.* p. 254, and 'Codice Atl.,' vol. 2, pp. 334–336.

‖ Richter, *l.c.*, pl. cxii.–cxix.

¶ *Zeitschr. f. bild. Kunst* (1881), vol. 16.

** *Proc. Royal Geogr. Society* (1884), pp. 323 *et seq.*

†† 'Ricerche intorno a Leonardo da Vinci,' vol. 1, 2nd ed. (Torino, 1896), pp. 70–84.

‡‡ The question has been discussed at last by E Müntz, *l.c.*, pp. 82–86.

§§ Rosenberg, pp. 110, 130 *et seq.*

fifteenth century, which are found among his papers,* are the works which gain for him an important place in the history of cartography,

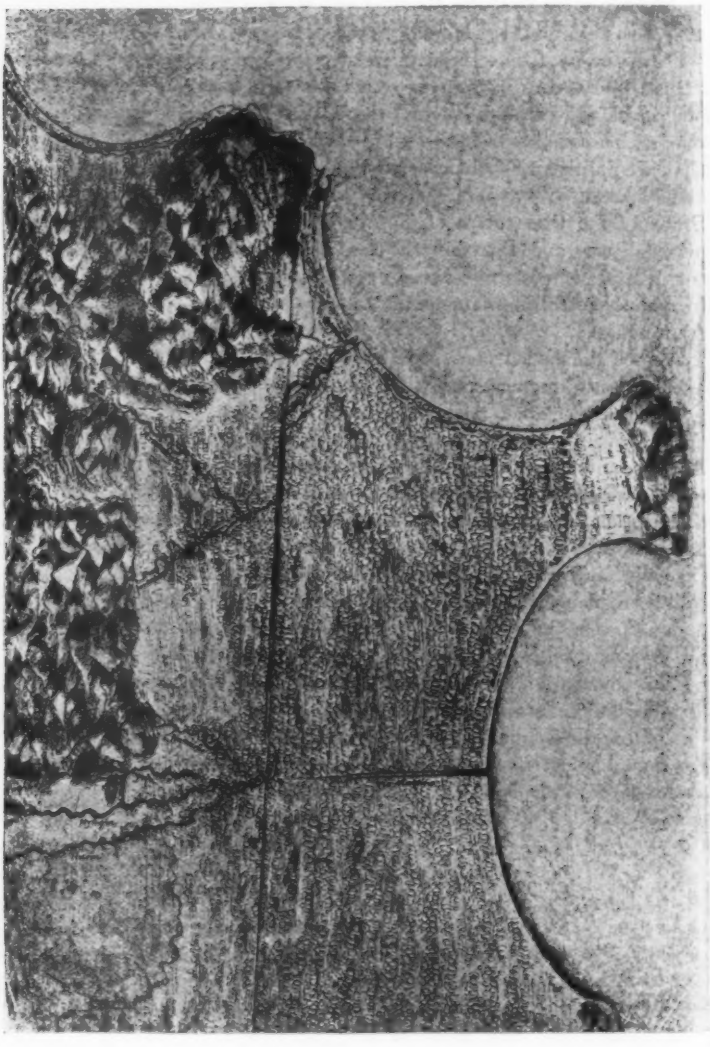

FIG. 4.—MAP OF POMPTINE MARSHES.

* Richter reproduces on pl. cxi. a sketch which shows the outlines of the Mediterranean and Africa with Mount Atlas, the Nile, and the Red sea, according to the world maps of the fifteenth century. A similar sketch of Europe is contained in the 'Codice Atl.,' vol. 2, fol. 361.

but the special maps and town plans based on his own surveys, and far in advance of the time in technique. Of the latter, town plans, there are very few of earlier date than the sixteenth century, and down to the seventeenth, and even the eighteenth, centuries perspective views of towns without a strict geometrical foundation predominate. This is true for plans of Rome,* as well as for those of Paris and London. As

FIG. 5.—PLAN OF IMOLA.
(*After T. P. Richter.*)

L. Gomme † shows, in a very interesting study of the question, the oldest existing plan of London appeared at the same time (1530-40) as the oldest one of Paris, that of Seb. Münster. Both give only a perspective representation of the town to suit the popular intelligence of the time. That architects and engineers had different ideas and

* E. Oberhummer, 'Der Stadtplan' (Berlin, 1907), p. 86 *et seq.* (from the *Verhandl. d. XVI. deutschen Geographentages*).

† *Geogr. Journal*, vol. 31, p. 616 *et seq.*

knew from early times how to draw real ground plans, we see, not only from the two great Vienna plans of 1547,* but also from the Capitoline town plans, as well as the building plans of Egyptian, Assyrian, and mediæval architects. Leonardo's plan of Imola is a further proof.

III.—Leonardo as a Physical Geographer.

I have dwelt the longer on Leonardo's cartographical work because, it seems to me, it has hitherto been the least valued. His contributions to physical geography, not to mention the older expositions of Venturi, Libri,† and others, have of late been so excellently worked up that I may confine myself to short references. J. P. Richter, in his often-quoted work,‡ has arranged in systematic order Leonardo's pronouncements on astronomy, physical geography, and topography, and recently Mario Baratta,§ in a comprehensive book, has dealt with the attitude of the artist to questions of physical geography, but this publication seems to be little known in geographical circles outside Italy. Though this exposition, as the author himself emphatically declares, can have no claim to finality, since Leonardo's literary remains are by no means fully accessible as yet, still it permanently determines the essential outlines of his conception of the nature of our planet. I shall now endeavour to bring out the most important points, referring German readers also to the book of Marie Herzfeld.‖

Passing over his remarks about the sun and moon and other celestial bodies, I shall first notice that Leonardo regards the Earth as a planet and as a star among the other stars, and decidedly rejects the notion that it occupies a privileged position in the universe, but places it only in the centre of the heavenly bodies accompanying the sun ("*la terra non è nel mezzo del cerchio del sole, nè nel mezzo del mondo, ma è ben nel mezzo de' sui elementi, compagni e uniti con lei*"). The conception of a movement of the Earth round its own axis and round the sun, which, of course, was not unknown in ancient times, is certainly not distinctly expressed by Leonardo, but it evidently occupied his thoughts, so that, with Nicolaus Cusanus, we must count him among the forerunners of Copernicus.¶ He was firmly convinced of the spherical form of the

* Oberhummer, *l.c.*, p. 27 *et seq.*

† Libri, 'Hist. des sciences mathématiques en Italie,' vol. 3 (Paris, 1840), p. 10. For Venturi, see above. Just in reading the proof, I am referred by Mr. D. Freshfield to an article of G. Séailles, "Léonard de Vinci Savant, sa méthode et sa conception de la science," *Rev. d. deux mondes*, September 1, 1892.

‡ *L.c.*, ch. xv., "Astronomy," pp. 135–72; ch. xvi., "Physical Geography," pp. 173–221; ch. xvii., "Topographical Notes," pp. 223–70.

§ 'Leonardo da Vinci ed i Problemi della Terra' (Torino, 1903), ch. xiv. p. 318 (*Biblioteca Vinciana*, No. 1).

‖ 'Leonardo da Vinci, der Denker, Forscher u. Poet.' Leipzig: 1904. 2 Aufl., 1906.

¶ Further information on these questions will be found in Richter's work, pp. 137 *et seq.*, and Baratta, cap. ii., "La forma e la posizione della Terra;" cap. iii., "La rotazione della Terra."

Earth, a fact that may seem to many beyond dispute, but must be insisted on in view of the doubt Columbus had to contend with in putting forth his project; a doubt which was not silenced till the

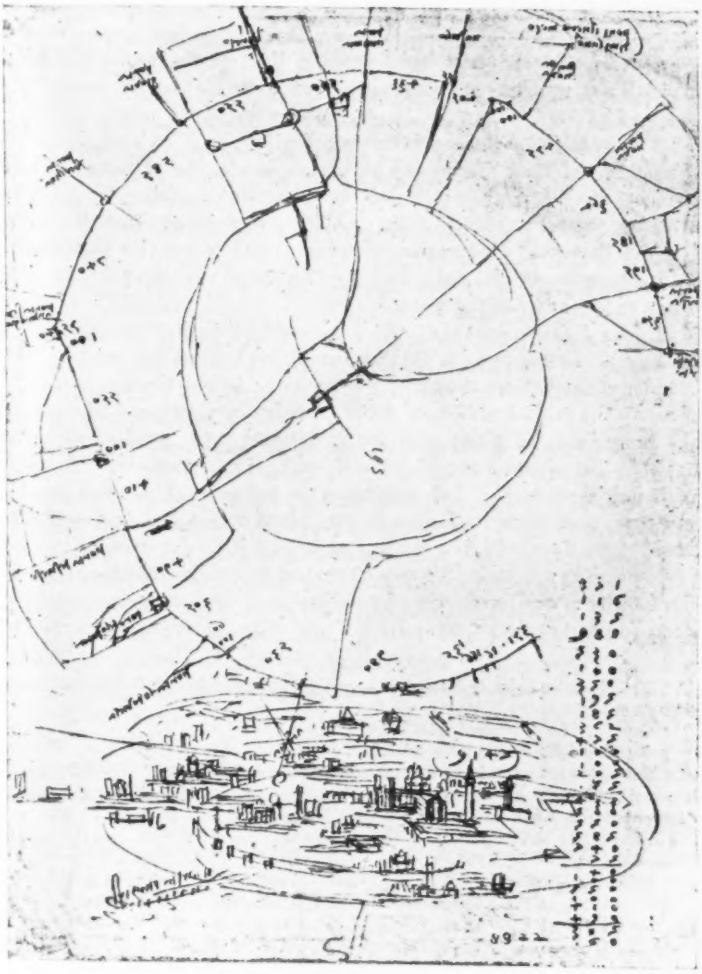

FIG. 6.—SKETCH OF MILAN.
(*After T. P. Richter.*)

circumnavigation of the world by Magellan. He calculated the diameter of the Earth to be 7000 miles, whether Milanese or Florentine is

uncertain.* The former would, according to Baratta,† amount to 7763½ English miles, the latter to 7192½, or 67¾ and 62¾ miles respectively to a degree of latitude.

The form of the globe is most fully stated in connection with the surface of the ocean (*la spera dell' acqua è perfettamente tonda*); this is the normal surface to which the elevations of the land are referred.‡ No part of the solid land lies below the level of the sea, to which all flowing water directs its course; no water surface can be lower than the sea.§

The salinity of the sea is not ascribed, as in Pliny's work, to the evaporation of the water by the sun's heat, but to the transport of salt particles by the rivers which lixiviate the saline deposits of the land; therefore the saline contents are constantly increasing. Notwithstanding the important observation that salt water is heavier than fresh, Leonardo assumes that only the upper layers of sea water contain salt, while at great depths the water is fresh.‖

By far the most important are the investigations into the movements of the sea. Leonardo, as A. Cialdi ¶ first showed, must be regarded as the founder of the modern theory of wave motion; he was the first to clearly perceive the orbital motion of water particles in waves, and to compare the progression of waves with the undulations of a wind-swept cornfield.** He also concerned himself with the phenomenon of tides. Although Posidonius †† had recognized the influence of the moon on ebb and flood, and Brunetto Latini, Dante,‡‡ and others had expressed the same views, Leonardo did not feel satisfied with this explanation, and propounded in opposition his own theory of a circulation of the water in the interior of the Earth, whereby the water of the ocean was sometimes sucked in and again let out. He acknowledges, however, a subordinate

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* I had occasion recently to raise this question, and was told that Italian critics consider Leonardo uses the Milanese mile.

† Cap. iv., "Le dimensioni della Terra."

‡ On the height of mountains, see below.

§ Baratta, cap. v., "Il livello del mare e l'altezza delle montagne." It need scarcely be remarked that the knowledge of depressions dates only from the nineteenth century. The Jordan trough was first recognized as a depression in 1837–38 by G. H. Schubert and J. Russegger, and Alderson and Symond confirmed the fact in 1842. See O. Peschel, *Gesch. d. Erdk.*, 2 Aufl., p. 545.

‖ Richter, pp. 188 *et seq.*; Baratta, cap. xii., 'Il mare;' Herzfeld, p. 61.

¶ "Leonardo da Vinci fondatore della doctrina sul moto ondoso del Mare," *Rivista marittima*, 1873, vol. 6.

** Baratta, cap. xiii., 'I moti del mare;' S. Günther, 'Handbuch der Geophysik,' 2 Aufl., vol. 2, pp. 439 *et seq.*; A. Penck, 'Morphologie,' vol. 2, p. 463.

†† F. Schühlein, 'Untersuchungen über des Posidonius Schrift *περὶ ὠκεανοῦ*,' vol. 2, pp. 83–99 (Freising: 1901). Further details of the tidal theory of the ancients are given by H. Berger, *Gesch. d. wiss Erdkunde d. Griechen*, 2 Aufl. pp. 289 and 560 *et seq.*, who, however, has overlooked the important researches of Schühlein.

‡‡ 'Paradiso,' canto 16, verso 82: "*Il volger del ciel della luna scopre ed iscopre i liti senza posa.*"

action of the moon when he says that on the coast of Flanders the flood of 20 ells may rise to 22 ells when the moon is favourably situated (*"quando la luna è in suo favore"*). The differences in the height of flood tide are well known to him, but he overestimates them in some cases—at Genoa, 0, at Venice, 2, in the North sea, 18, in the Loire, 20, in the Garonne, 40 (!) ells.*

He studied with no less care the problem of currents. The local currents in narrow seas first drew his attention, especially the current in the straits of Gibraltar, which, however, he erroneously assumed to set principally towards the west. This is the case sometimes at high tide, and with an east wind,† but Leonardo's theory is bound up with the notion of a general flow from the Nile and Black sea towards the ocean; the surface current of the Bosphorus and the Dardanelles naturally falls in with this theory. The large rivers discharging into the Mediterranean and Black seas, with a subterranean drainage from the Caspian, are the sources of this excess of water.‡ The ocean currents, of which little certain was known at that time, are accounted for by Leonardo by the warming of the sea in the equatorial regions and the flow towards the lower-lying polar seas, which agrees with recent views of atmospheric circulation.§

Leonardo's investigations on the movements of water are the main feature of his geographical work. They are connected with his technical studies on hydraulics, which projects for the construction of canals and mills led him to pursue. These studies were embodied in a work composed in 1500, 'Del Moto e della Misura dell' aqua,' which was printed in 1826, and which contains an admirable exposition of the laws of hydromechanics.‖ His views on hydrostatics explain his theory that water traverses the earth in channels and veins, branching out in all directions, and even penetrates into the higher mountains. This theory is most fully set forth in a manuscript in the library of the Earl of Leicester in Norfolk.¶ The Earth is, like the bodies of living beings (*animali*), a network of branching veins which are all connected with one another, and serve to vitalize and sustain the earth and its creatures. Water starts from the depths of the sea, and after long, circuitous wanderings returns through the rivers, which spring up from the clefts of the veins. He tried to bring the ascent of the water under physical laws by comparing it with the syphon and the circulation of the blood,

* Richter, *l.c.*, pp. 192 *et seq.*; Baratta, pp. 172 *et seq.*

† Boguslawski-Krümmel, 'Handbuch der Ozeanographie,' vol. 2, p. 296; 'The Mediterranean Pilot,' vol. 1, 3rd edit., pp. 19 *et seq.*

‡ Richter, pp. 258, 268; Baratta, p. 184.

§ Baratta, p. 188; Günther, *l.c.*, vol. 2, p. 573.

‖ Richter, p. 173; Baratta, pp. 126, 313.

¶ A splendid edition of this important manuscript just now is coming out by G. Calvi, 'Il Codice di Leon. da Vinci (Idraulica e Cosmografia) della Biblioteca di Lord Leicester in Holkham Hall.' Milano: 1909. Fol.

just as William Harvey, a century later, supported his noted discovery by reference to the circulation of water on the Earth.* Though Leonardo's explanation was wrong, it rests partly on correct observations, to which we must add a certain acquaintance with the Karst phenomenon, and deserves the greatest respect as an ingenious attempt to bring the circulation of water into causal connection. Leonardo appears afterwards to have modified his theory, as is shown by a passage in the 'Codice Atlantico,'† and to have acknowledged the meteoric origin of flowing water. Such contradictions occur in some of his other notes, which date from widely separated years of his life, and are often the outcome of momentary impressions.

He took great interest in the mechanical action of flowing water, both at the confluence of streams and where islands obstruct the water, to which the drawing above mentioned refers, and also as regards the solid matter with which rivers are loaded. He follows the course of large stones from the upper reaches of the river within the mountains, where their edges are not yet worn down, then considers the deposition of large and small pebbles, and then of sand, which becomes finer and finer until it passes into suspended mud. He notices the consolidation of these deposits into stone and tuff in some of the north Italian rivers (Adige, Adda, Ticino, Arno), and the damming up of lakes by river alluvium. In this process he recognizes the essential cause of lake formation, and illustrates it by examples from the lakes of upper Italy.‡ As the alluvium alters the course of rivers and causes the formation of lakes, so also it displaces the coast-line towards the sea and gradually silts up enclosed sea-basins ("*Muovonsi al continuo i liti marittimi inverso il mezzo del mare e lo scaccian dal suo primo sito*"). Thus the bay between the Apennines and the German Alps has been filled in by the Po and its tributaries, and the same fate is in store for the Adriatic sea.§ Still more extensive is the alteration in the basin of the Danube, where once the Euxine spread over the plain of Hungary to Austria and Bavaria, as proved by the fossils on the mountain flanks; it covered the South Russian plain (*pianura del Tanai*) to the Rhipæan mountains, and was confined on the south by a great range, in which the Alps (Monte Adula) from the west and the Taurus from the east met together. The discharge through the Propontis to the Ægean sea gradually broke down the continuity of the mountains, and lowered the surface of the Pontic sea by about 1000 ells, whereby the plains were left dry and the Danube took possession of its present bed.‖ One is naturally reminded by this

* Baratta, cap. ix.: "L'interna Circolazione delle acque."

† "*L'acqua delli fiumi non dal mare ma dalli nuvoli à origine*," fol. 160; Baratta, p. 132.

‡ Baratta, cap. xi., 'I Laghi.'

§ Richter, p. 192; Baratta, pp. 252 *et seq.*

‖ Leicester MS., pl. i.; Baratta, p. 252.

exposition of modern geological researches concerning the "Sarmatic" and "Pontic" sea, and one is astonished at the intellect which, four hundred years ago, far in advance of the times, could arrive at similar conclusions.

The predominating rôle in the morphological changes in the Earth's surface which Leonardo assigns to water makes him seem a predecessor of the Neptunists. He declares absolutely that rocks are of sedimentary origin, and conceives mountains to be accumulations of river alluvium; * that mountains rise to a considerable height above the water-level is due to the fall of the surface of the sea and the irruption of masses of water into the interior of the earth. But he underestimates the height of mountains when he assumes that the highest mountains of Europe, which he rightly takes to be the French Alps, do not rise to a mile (about 5200 feet) above sea-level.† Though this estimate is far behind the truth, it is yet in agreement with a much later statement by Galileo,‡ and avoids the enormous exaggerations into which men even in the seventeenth century, as Snellius and Riccioli, strayed in reckoning the height of mountains.§ The folding of strata (*li piegamenti delle falde*) escaped his sharp observation as little as the fossils enclosed. His opinions on the latter are the more worthy of remark that even down to the eighteenth century the most contradictory assertions were made about the nature of fossils. They were regarded as freaks of Nature or purely mineral formations, at best as organisms which had grown in the ground, or, if their aqueous origin was conceded, as evidence of the Deluge. The latter view especially had zealous champions in the eighteenth century both in England and in Germany, and contrary opinions were condemned as irreligious. Leonardo was, it appears, the first to declare confidently that fossils were the remains of marine animals which had been covered with river sediment, and on the retreat of the sea had been left on dry land. He opposes with some sarcasm the then prevalent belief in the influence of the stars on the formation of fossils, which, he says, could only be shared by persons of little discrimination (*di non troppo discorso*), and likewise rejects all connection with the Deluge, as also did Fracastoro somewhat later.‖

About the Deluge itself he speaks with remarkable freedom.¶ The

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* 'Cod. Atl.,' fol. 160: "*Li sassi si compongono e falde, o vero a gradi, secondo lo scaricamento della turbulenze portate dal corso de' fiumi'—li monti son fatti dalli corsi de' fiumi,*" Baratta, cap. xvi., 'L'Orogenesi e la Stratigrafia.'

† "*Le Alpi galliche son la piu alte parte dell' Europanessun de' monti d'Europa n' leva un miglio sopra la pelle delli nostri mari,*" Baratta, p. 69.

‡ Opere, vol. 3 (Firenze, 1843), p. 70: "*In tellure nulli exstant montes qui viz ad unius milliaris altitudinem perpendicularem accedant.*"

§ Peschel, 'Gesch. d. Erdk.' 2 Aufl., pp. 62, 426.

Zittel, 'Gesch. d. Geol. u. Palæont,' pp. 15 *et seq.*; Baratta, cap. xvii. 'I. fossili.'

¶ The chief sentences of the passage, the sense of which is reproduced in the free translation above, run in the 'Codice Atl.,' fol. 155, as follows: "*e se così la pioggia*

question whether Noah's flood was universal must be answered in the negative. Had the water, as the Biblical narrative asserts, risen above the highest summits, it must have formed a spherical envelope everywhere equidistant from the centre, and therefore could not flow off anywhere, as only gravity could lend it motion. How could this inert mass pass away? All natural explanations fail, and one must resort to miraculous aid or assume that the sun effected the evaporation of such a volume of water. The independence with which Leonardo maintains his scientific judgment in opposition to Biblical tradition is surprising in that age, but it finds its counterpart in many bold views of the Italian Renaissance on ecclesiastical matters and questions of faith from Dante down to Leo X.* The Reformation and the counter-reformation which set in with the Council of Trent perfected slavish subjection to the very letter of the Scriptures. What Copernicus could still dare became fatal to a Galileo, and encountered the opposition even of Protestant orthodoxy.

As Leonardo regarded the constructive activity of water as the chief factor in moulding the relief of the Earth's surface, so he attributed the greatest effects to erosion; nay, in this direction he may be said to have anticipated much of the modern doctrine of valley formation. Almost all details of the action of erosion are alluded to in a passage contained in his famous book on painting.† "The sculpture of the mountains is effected by rivers which are formed from rain, snow, hail, and ice melted by the summer sun. When melted, the water is collected in many small brooks, which gather from all sides into large streams and grow larger as they advance, until they meet in a great ocean. During their course they undermine the one bank and deposit their load on the other, until they have traversed the whole breadth of the valley. But this is not all; they tear away the bases of the valley slopes (*dei monti laterali*), which then fall into the rivers and dam up the valley. As though in revenge they close the way to the river and convert it into a lake, where the hemmed-in water moves exceedingly slowly, until the obstruction formed by the landslip is again demolished by the water."

Of the numerous other passages where the process of erosion is

fussi universale, ella vesti di se la nostra terra di figura sperica e la superfizie sperica ad ogni sua parte egualmente distante al centro della sua spera, onde la spera dell' acqua, trovandosi nel modo della detta condizione, elli è impossibile che l'acqua sopra di lei si mova, perchè l'acqua in se non si move, s'ella non discende; addunque l'acqua di tanto diluvio come si parti, se qui è provato non aver moto? E qui mancano le ragion naturali onde bisogna per soccorso di tal dobitazione, chiamare il miracolo per aiuto o dire che tale acqua fu vaporata dal calor del sole." Further extracts in Herzfeld, *l.c.*, pp. 69–79.

* Examples are given by Ludwig Geiger, 'Renaissance u. Humanismus,' p. 103 (Poggio); p. 108 (Gemisthos Plethon); p. 129 (Laur. Valla); p. 200 (Pulci); p. 289 (Pomponazzi); and others.

† Lionardo da Vinci, Das Buch von der Malerei. Nach dem 'Cod. Vat. Urb.,' 1270, herausg. von H. Ludwig; II. Band (Wien, 1882), p. 209 (Quellenschriften für Kunstgeschichte Bd., 15–18).

described, another may be cited from the Leicester MS.* "The rivers have sawn through (*segati*) the members of the high Alps and separated one from another. One can perceive this in the arrangement of the stratified rocks (*pietre faldate*), for one can trace the corresponding strata on both sides of the valley from the river up to the summits." The sentence quoted above on the carving out of the mountains by rivers, Leonardo completes by the addition "*li monti son disfacti dalle pioggie e dalli fiumi.*" He is convinced that the goal to which erosion tends is the complete degradation of the continents; the constant transport of solid matter into the sea must, however, have the effect of raising the level of the sea, which will at length overflow the levelled land and form a perfectly spherical surface.†

Erosion works also in the interior of the Earth, in the channels traversed by the water; the subsidence of the Earth's crust is a consequence, and the flooding of subsided blocks, as in the case of Sodom and Gomorrah.‡ It has already been pointed out that the subterranean cavities in the stream-courses of the Karst have a bearing on this theory. Furthermore, the masses of rock loosened by erosion in the interior of the Earth are carried out by the water and deposited on the sea-bottom in the form of detritus cones, which gradually rise, and finally emerge as islands above the sea-surface.§ Also connected with the same subject is the theory, propounded in the essay "Della natura, moto, e peso dell' acqua," of the origin of earthquakes in the tension produced by water converted into steam by the natural heat in the interior of the Earth. Afterwards, when Leonardo abandoned his theory of internal water circulation and acknowledged meteoric precipitation as the source of springs and rivers, he modified also his doctrine of earthquakes, attributing them to the compression of air produced by the falling in of subterranean cavities. He appears never to have observed volcanic phenomena personally, and speaks of them casually only.‖

Leonardo's meteorological conceptions need much elucidation. He inquires chiefly into the cause and effect of winds, which on the sea produce waves, on the land sand dunes,¶ as in Libya and the plain of the Po, and also into the humidity of the air and precipitation. Much of this is to be found in his book on painting, where a separate

* Richter, fol. 10, p. 205; Baratta, p. 211. A similar passage from a manuscript in the British Museum is given by Richter, p. 95, and Herzfeld, p. 64.

† Passages from the 'Cod. Atl.' etc., in Baratta, pp. 208, 263.

‡ "*Profondamento di paesi come nel Mare Morto di Soria, cioè Sodoma e Gomorra,*" Leicester MS., fol. 36; Baratta, p. 215.

§ Paris MS. G., fol. 44, from Ch. Ravaison-Mollien, 'Les manuscrits de Leonardo da Vinci' (Paris: 1890). The passage is also quoted by Herzfeld, p. 60.

‖ Baratta, cap. xiv., 'I Vulcani ed i Terremoti;' Herzfeld, p. 67.

¶ Baratta, cap. vii., 'L'Atmosfera.'

chapter deals with clouds.* These are formed of the moisture dispersed through the atmosphere, which is condensed by cold. Air flows into the empty space caused by condensation, for Nature abhors a vacuum (*perchè non si da vacuo in natura*), and thus arise winds, as also when the sun again disperses the mist. "A cloud is lighter than the air below it and heavier than the air above it." Clouds are mist raised by the sun to a height where their weight balances the elevating force. The particles of vapour (*particole dell' umido vaporate*) compressed by the movement congregate into drops, which, owing to their weight, fall to the Earth as rain. That rain exerts a destructive action on the Earth's crust is stated in the sentence quoted above, "*li monti son disfacti dalle pioggie.*" Purely theoretic is the conclusion that the foot of the mountains is affected more than the summits, since the acceleration of the raindrops must also increase their force.† That Leonardo also constructed a hygrometer, by which he determined the humidity of the air, and could predict rain, has been frequently pointed out. The idea, indeed, was not a new one, but had been conceived already by Nicolaus Cusanus (1464) and Leon Battista Alberti (1485). Leonardo developed it further, and suggested several methods of construction.‡

Many other remarks of Leonardo relating to physical geography might be cited here, as, for instance, on the formation of soil,§ on the origin of waterspouts and wind vortices,‖ on the transparency and blue colour of the air,¶ on the twinkling of stars and the light of the moon,** etc.; but enough has been said to show that Leonardo was one of the greatest pioneers of the school of physical geography, which bases its knowledge chiefly on observation and experience. A. von Humboldt†† most justly calls him the greatest physicist of the fifteenth century, who combined exceptional mathematical knowledge with the most

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* H. Ludwig, *l.c.*, vol. 2, pp. 320–29.

† 'Cod. Atl.,' fol. 162 and 160; Baratta, cap. viii., 'Le Acque meteoriche.'

‡ Venturi, *l.c.*, p. 28; C. Amoretti, 'Memorie su Leon. da Vinci' (Milano: 1804), pp. 143 *et seq.*; Humboldt, 'Kosmos,' vol. 2, pp. 381, 517; Richter, *l.c.*, vol. 1. p. 297; Baratta, pp. 92 *et seq.*

§ Baratta, pp. 204 *et seq.*

‖ The remarkable passage in the Leicester MS., fol. 22, is here given from Richter, vol. 2, p. 219: "The eddies of wind at the mouth of certain valleys strike upon the waters and scoop them out in a great hollow, and whirl the water into the air in the form of a column and of the colour of a cloud. And I saw this thing happen on a sandbank in the Arno, where the sand was hollowed out to a greater depth than the stature of a man, and with it the gravel was whirled round and flung about over a great space; it appeared in the air in the form of a great bell-tower, and the top spread like the branches of a pine-tree, and then it bent at the contact of the direct wind which passed over from the mountains."

¶ Leicester MS., fol. 20; Richter, p. 219.

** Humboldt, 'Kosmos,' vol. 2, p. 356; vol. 3, p. 499; Günther, 'Geophysik,' 2 Aufl., vol. 1, p. 118; Richter, pp. 154–168, 'The Moon;' pp. 169–172, 'The Stars;' Baratta pp. 270 *et seq.*, 274 *et seq.*

†† 'Kosmos,' vol. 2, pp. 324, 484; vol. 3, p. 10.

astonishing penetration into the secrets of Nature. Like Francis Bacon, quite a century later, he considered induction to be the only reliable method in science, "*dobbiamo cominciare dall' esperienza, e per mezzo di questa scoprirne la ragione.*"

Leonardo's opinion that nature knowledge must always be based on experience is quite in keeping with the principles he laid down for the practice of art. As he himself from earliest youth found the most exact study of natural forms an indispensable duty, and preserved in his drawing the structure of leaves, trees, and wood in its finest ramifications, while he paved the way for the portrayal of the human body by a careful study of anatomy, so also he demanded of other painters direct imitation of Nature. "I say to the painters," he writes in his 'Book on Painting,' p. 81, "that one should never imitate the style of another, for he will then be called, as far as art is concerned, not a son, but a grandson of Nature." "Great inspiration," he affirms in another place, "springs only from much knowledge of inspired objects."

IV.—Leonardo as Alpinist and Landscape Painter.

It was a warm, lively sympathy with Nature in all her forms which made Leonardo a great artist, and at the same time a pioneer in research.* This sympathy with Nature reveals itself especially in his affection for the Alps and their artistic reproduction. Recently there has been a desire to class him as an Alpinist, but this is true only in a very limited sense. The following noteworthy passage occurs in the Leicester MS., fol. 4.† "And this may be seen, as I saw it, by any one going up Monboso, a ridge (? *giogo*) of the Alps which divide France from Italy. The base of this mountain gives birth to the four rivers which flow in four different directions through the whole of Europe. And no mountain has its summit at so great a height as this, which lifts itself above almost all the clouds, and snow seldom falls there, but only hail in the summer, when the clouds are highest. And this hail lies there, so that if it were not for the absorption (? *retà*, probably *rarità*) of the rising and falling clouds, which does not happen twice in an age (? *età*, probably *estate*, summer), an enormous mass of ice would be piled up there by the layers of hail, and in the middle of July I found it very considerable; and I saw the sky above me quite dark, and the sun as it fell on the mountain was far brighter here than in the plains below because a smaller extent of atmosphere lay between the summit of the mountain and the sun." This shows that Leonardo

* Compare herewith the excellent article of A. Farinelli, "Sentimento e Concetto della Natura in Leonardo da Vinci," in 'Miscellanea di Studi critici edita in onore di Arturo Graf' (Bergamo: 1903), pp. 285–365.

† From Richter, p. 246.

once ascended as high as 3000 metres at least somewhere in the western Alps of Italy, and observed snowfields and glaciers, the colour of the firmament, the purity of the air, and the radiation peculiar to such heights. The position is only vaguely indicated by the name Monboso. By the four rivers only the Po, the Rhone, the Rhine, and the Danube can be meant; and this is confirmed by another passage of the same manuscript,* where these rivers are mentioned. Their sources cannot be localized in a single mountain group; a comparison of both passages rather tends to show that the Alps in general are referred to as the water-parting of the four great river-basins. The indication "on the boundary of France and Italy" gives little help. It can only mean a language boundary,† and distinguishes the Alps as separating countries, as is fully apparent in the second passage, where the words "*che dividono la Magnia* (Germany) *e la Francia dalla Italia*" occur. There remains only the name Monboso, which is unknown in the modern nomenclature of the Alps. Richter suggested Monte Rosa, while Douglas W. Freshfield, in his critical study 'The Alpine Notes of Leonardo da Vinci,' had proposed Monte Viso,‡ but rejected later this opinion in favour of Monte Rosa.§ He rightly points out that the word *giogo* means a pass or ridge rather than a summit. Certainly the terms applied to these natural features were often used loosely; but, considering the structure of the Alps, it seems incredible that Leonardo climbed one of the culminating peaks of the western Alps. At the most he probably reached the region of snow. G. Uzielli ‖ has investigated the question the most thoroughly. From evidence he brings forward from the fifteenth to the eighteenth century there can be no doubt that the name Monboso (= Mons Silvius) was then actually in use to distinguish Monte Rosa, and M. Jacobi ¶ has no reason to treat the identification as still uncertain. Even in modern maps the name M. Bó is found on the spur stretching south-east of Monte Rosa between Val Sesia and Biella. At any rate, this episode of Leonardo's life is as interesting as a contribution to the history of mountain climbing as it is characteristic of him as a friend and observer of nature.

His studies of Alpine scenery were not confined to the western Alps, as is shown by his geographical observations in the Adige basin and the artistic reproduction of mountain forms evidently taken from the

* Leicester MS., fol. 10; Richter, p. 247.

† This is more likely than the political boundary of France, which then extended to the main crest of the Alps only in the Briançonnais. See Spruner-Menke, 'Hist. Handatlas,' No. 54.

‡ *Proc. R. Geogr. Soc.*, 1884, pp. 335–40.

§ See his critical account on Uzielli's paper in *Proc. R. Geogr. Soc.*, 1892, pp. 345 *et seq.*

‖ 'Leonardo da Vinci e le Alpi.' Torino: 1890 (from *Boll. Club Alp.*, vol. 23). For further evidence see E. Oberhummer, "Die ältesten Karten der Westalpen," *Zeitschrift d. D. u. Oe. Alpenver*, 1909.

¶ "Leonardo da Vinci als Alpinist" (*Beilage zur Allgem. Zeitung*, 1904, No. 155)

Dolomites, and partly, perhaps, from the Karst. His preference for steep and rugged rocks and grottoes is seen in his treatment of the background of several of his most famous pictures. Among these are one of his greatest masterpieces, the portrait of Mona Lisa in the Louvre, and also the Madonna of the Rocks ("La Vierge aux Rochers"), which exists in two versions, one in the Louvre, the other in the National Gallery in London, of which the relationship has not been definitely explained; the Madonna with St. Anna and with the scales ("La Vierge aux Balances") in the Louvre, another in Munich, the Resurrection in Berlin, the female portrait in the Hermitage at St. Petersburg,* etc.

V.—Albrecht Dürer and Other Artists of the Renaissance in Relation to Geography.

We have now arrived at a point whence we may pass on to some general consideration of the art and artists of the Renaissance to landscape painting. Without plunging into a discussion of the history of art, we must point out that the awakening of the mind to understand Nature, an appreciation of what is real, and the gradual undermining of traditional beliefs, are characteristic of the culture development of the Renaissance, and towards the end of the Middle Ages come to light in imitative art, as in all other spheres of intellectual life. One of the most attractive sections in A. von Humboldt's† description of the universe deals with the reaction of the outer world on the imagination, the history of the poetical description of Nature, and landscape painting. That the latter rose from the position of a subordinate and often fantastic addition to figure painting to an independent representation and artistic reproduction of Nature, is an effect of the new spirit, the beat of whose wing was first felt by the contemporaries of Dante. As in the thirteenth century maps first appeared, in the place of the distorted map-sketches of antiquity and the diagrammatic drawings of mediæval monks, and showed with astonishing correctness the outlines of the Mediterranean, so at the same time we see the Florentine Cimabue casting off the bonds of Byzantine tradition in painting, and the dawn of a new art break forth under his great successor, Giotto. "With the advent of Giotto mountain scenery first became a subject for art" (Bredt). The feeling for Nature which prompted Petrarch's famous description of the ascent of Mont Ventoux, meets us also in the first beginnings of Tuscan painting.‡ Only a little later the delight in

* Rosenberg, *l. c.*, pp. 113–123; E. W. Bredt in *Zeitschrift d. D. u. Oe. Alpenver*, 1906, pp. 87 *et seq.*

† 'Kosmos,' vol. 2, pp. 1–134.

‡ See W. Kallab, "Die toskanische Landschaftsmalerei im 14 u. 15 Jahrhundert" (*Jahrbuch der kunsthist. Samml. d. allerh. Kaiserhauses*, 1900, pp. 1–90); Guthmann, "Die Landschaft in der toskanischen u. umbrischen Kunst von Giotto bis Rafael." Strassburg: 1903.

scenery also appeared on German soil, and precisely in those provinces where, after the invention of the compass, the oldest intercourse with Italy by sea had grown up, in Flanders and Brabant. The altar-piece of the artists Hubert and Jan van Eyck at Ghent had the effect of a revelation, and marked the victory of the naturalistic tendency in the school of Flanders, and the Brabant school, with Rogier van der Weyden and Hans Memling, soon followed on the same lines. By slow degrees the

FIG. 7.—NORTHERN FIRMAMENT, BY A. DÜRER.

(*From a Copy in the British Museum.*)

artists of the lower Rhine and Cologne joined themselves to these; Martin Schongauer turned the art of Upper Germany into the new direction, and with Albrecht Dürer the new school attained full sway. With him L. Kaemmerer * concludes his welcome studies on "Die Landschaft

* In *Beitr. z. Kunstgesch.*, N.F. 4. Leipzig: 1886.

in der deutschen Kunst." E. W. Bredt, who has recently treated of Alpine landscape painting in a series of suggestive articles,* actually styles Dürer the *Entdecker der künstlerischen Alpenlandschaft.* The view of Klausen in Tyrol,† cited by him as an example, seems to me so far remarkable that it has almost the effect of a prospective map like many

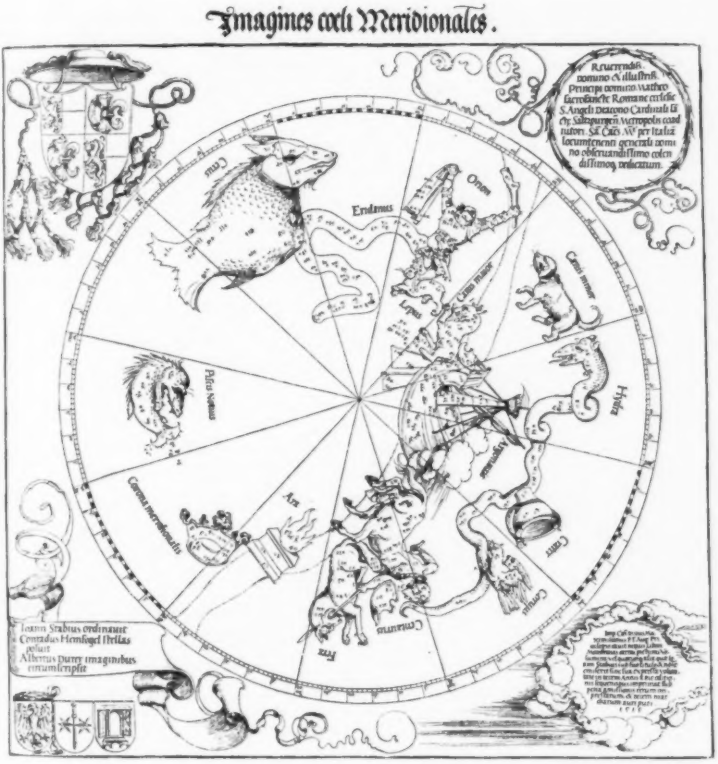

FIG. 8.—SOUTHERN FIRMAMENT, BY A. DÜRER.
(*From a Copy in the British Museum.*)

of the productions of the *barocco* time in which the distinction between a map and a landscape almost vanishes;‡ they correspond to the

* "Wie die Künstler die Alpen dargestellt." (*Zeitschrift d. D. u. Oe. Alpenver*, 1906–1908.)

† *L.c.*, 1906, pp. 70 *et seq.*

‡ See, for instance, Phil. Gretter's 'Landtaffel der schönen Gelegenheit umb Boll,' 1602, published by C. Regelmann (Tübingen: 1902). Also *Geogr. Zeitschr.*, 1904, pp. 55 *et seq.* Oberhummer in *Zeitschrift d. D. u. Oe. Alpenver*, 1907, p. 13 *et seq.* (Map of Berchtesgaslen A D. 1628.)

numerous town drawings of the sixteenth and seventeenth centuries, which leave us in doubt whether to call them plans or views.*

It is impossible to dwell more fully here on Dürer's landscape art, nor must the further development of landscape painting which attained its culmination in Italy in the hands of Tizian,† but found its proper home in the Netherlands (Ruisdael, Hobbema, etc.), detain us; the literature of art history may be consulted.‡ But Albrecht Dürer merits our interest in other respects. Though he has not, like Leonardo, attacked the problems of physical geography, still in his 'Underweysung der messung mit dem zirckel und richtscheyd' (Nürnberg, 1525), 'Underricht zur Befestigung der Stett' (Nürnberg, 1527), and in his practical work as fortress engineer, he has approached the subject of mathematical geography, more especially, however, in his personal relations with the excellent cartographer, Johannes Stabius. To these we owe two star maps, ingeniously executed by the hand of Dürer, and a world map, which no less a person than Carl Ritter has rescued from oblivion. During his stay in Vienna in 1847 he found the wooden blocks of the map in the Court library and caused a fresh impression to be taken, from which a reduced lithographic copy was published, with a full description by Sotzmann.§ An original print of the map is not known, but a copy of 1781, which A. Bartsch had made, is preserved in the Albertina at Vienna. Both star maps seem to have been distributed in several copies. Lately they have been issued in reduced form and described by the astronomer E. Weiss,‖ as well as a new impression of the map of the world. The co-operation of Dürer in the star maps is made certain by the annotation, *Joann Stabius ordinavit, Conradus Heinfogel stellas posuit. Albertus Durer imaginibus circumscripsit.* Thus the projection is the work of Stabius; it differs from that of our star maps in that the hemispheres are bounded by the ecliptic and not by the equator, and the pole of the ecliptic is the centre of projection. Heinfogel, a Nuremberg mathematician, placed the stars in position, from the Almagest of Ptolemy, and Dürer drew the figures of the constellations,

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* Oberhummer, 'Der Stadtplan,' *l. c.*, p. 94. Striking examples are the plan-views of Florence (1490) and Venice (1500), in L. Geiger's 'Renaissance,' pp. 190, 264; of Paris, by Seb. Münster (1550); of Vienna, by J. Houfnagel (1609). For London plans see the article of L. Gomme in *Geogr. Journ.*, vol. 31 (1908), p. 616.

† Ernst Zimmermann, "Die Landschaft in der venezianischen Malerei bis zum Tode Tizians," Leipzig: 1893 (*Beitr. z. Kunstgesch.*, N.F. 20).

‡ In addition to the writings already mentioned, particular reference may be made to J. Gilbert, 'Landscape in Art' (London: 1885); and K. von Lichtenberg, "Zur Entwickelungsgeschichte der Landschaftsmalerei" (Leipzig: 1892) (*Beitr. zur Kunstgesch.*, 18).

§ *Monatsber. üb. d. Verhandl. d. Ges. f. Erdkunde. z. Berlin*, N.F., vol. 5 (1848), pp. 230–56, Tafel IV.

‖ "Albrecht Dürer's geographische, astronomische und astrologische Tafeln" (*Jahrbuch d. Kunsthist. Samml.*, 1888, pp. 207–20). On the star maps Sotzmann also, *l.c.*, pp. 247 *et seq.* R. Wolf, 'Gesch. d. Astron.,' p. 422 *et seq.*

also according to Ptolemy's directions. Though Arabic and even ancient celestial globes* are known to us, no older star maps of the whole heaven than that of Stabius and Dürer seem to have been preserved. That Dürer also took an interest in the construction of globes appears from his direction to divide the surface into sixteen gores.† Concerning the map of the world, I am glad to join here (p. 628) a reduced copy of the impression A.D. 1847, preserved in the British Museum.‡

Dürer's map of the world, a large double sheet of 65 by 86 centimetres, embraces only the eastern hemisphere. The pole of projection lies at the intersection of the meridian of 90° with the tropic of Cancer, so that northwards the map extends beyond the pole, but southwards only to 50° S. lat. From west to east it reaches in the middle only over 160°, and about the same from north to south. It cannot therefore be described as an *orthogonale Horizontalprojektion* (Weiss), but is an external azimuthal projection. Practically, however, it differs little from the orthographic. It represents the globe as it would appear to an observer placed in the zenith of the tropic of Cancer at 90° of latitude east of Ferro, and at a distance of six times the earth's radius from the centre of the earth.§ The globular appearance is emphasized by the inclusion of the whole north polar calotte down to 75° N. lat. On the other hand the map suffers, as in all orthogonal projections, from a contraction of the peripheral parts, which distorts Europe especially; in the case of Asia ignorance of the north-eastern part, and in Africa the narrowing of the continent towards the south, contributed to minimize this difficulty. As far as the drawing of the Ptolemaic maps could be utilized they were followed throughout; only the north (*Engroneland*), South Africa, and Madagascar, are added from contemporary maps. But the actual form of Africa, then fairly well known, is not preserved; the gulf of Guinea is not shown at all, and the southern extremity is bent round to the east.

For the contents of the map Stabius is alone responsible; his arms adorn the lower left-hand corner, and he only is set down on the map as the author, both in the dedication to the Archbishop of Salzburg, Cardinal Mathias Lang (whose arms are above on the left), and in the imperial license (dated 1515). Now, though Dürer's co-operation is not vouched for by his name or monogram, the artistic decoration generally passes for his work. Bartsch showed the harmony of the ornamental accessories with those of the star maps and the copy of 1781 was

* Further information in M. Fiorini's 'Erd. u. Himmelsgloben,' revised by S. Günther. Leipzig: 1895.

† Fiorini-Günther, pp. 71 *et seq.*

‡ See C. Dodgson, 'Catalogue of Early German and Flemish Woodcuts in the British Museum,' 1 (1903).

§ Penck, *Geogr. Abhandlungen*, vol. 5, p. 9.

inscribed, "*Editum ex tabula lignea ab Alberto Durer incisa.*" The most prominent students of Dürer, as M. Thausig,* agree with him. It is quite in accordance with the close relations in which Stabius, one of the first geographers of his time, stood to Dürer; he had, moreover, worked at the design of the triumphal arch of the Emperor Maximilian, Dürer's greatest wood-carving, and studiously availed himself of the opportunity afforded by his sojourn in Nuremberg to frequent the society of artists, and enlist them for the publication of his astronomical and geographical sheets. The spirited heads which symbolize the twelve principal winds are genuine Dürer work, and are decorated with sharp or peacock's feathers according as the winds are rude or mild. A quite similar treatment of the winds is seen in the 'Carta Marina' of Martin Waldseemüller of 1516, which betrays in its artistic decoration the influence of Dürer's school.†

Dürer's connections with geography are not exhausted. Apart from perspective plans and suchlike drawings derived from his studies in fortification (see above),‡ his 'Tagebuch der Reise in die Niederlande'§ is not without interest. While it consists chiefly of notes on stages, expenses, and works of arts, it also contains a noteworthy passage on the Aztec works of art which Cortez sent to the Emperor, and Dürer had an opportunity of seeing at Brussels (1520). The delight caused by these products of an unknown and strange civilization expresses itself in the words of Dürer‖ just as in the impression they made on Cortez himself.¶

Carl Ritter** goes too far when he sums up his judgment of Dürer in the words, "*So dürften wir denn den grossen deutschen Meister auch zu unsern ersten deutschen Geographen und Landkartenzeichnern rechnen, deren Reigen er anführt mit Meisterschaft.*" For the map, as such, is not his work, as we have seen, and, moreover, we are now acquainted with older and far more important German cartographical work than the hemisphere of Stabius. His services to geography are rather due to his artistic labours, in the influence he brought to bear on the understanding of natural forms and scenery, and in advancing the arts of

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* 'Dürer,' 2 Aufl., vol. 2, pp. 114 *et seq.*

† Jos. Fischer u. F. von Wieser, 'Die älteste Karte mit dem Namen Amerika,' p. 19.

‡ Val. Scherer, 'Dürer' (Stuttg: 1904), pp. 326 *et seq.*

§ Published by F. Leitschuh, Leipzig, 1884.

‖ *Loc. cit.*, p. 58. "*Auch hab' ich gesehen die dinge die man dem könig aus dem neuen gulden land hat gebracht, ein gross gulden sonnen, eines ganzen klafter breith, dgl. ein ganz silbern mond, auch also gross, u.s.w. Hab aber all mein Lebtag nichts gesehen, das mein herz also erfreut hat als diese ding.*"

¶ He writes in his letter (1520), "The ornaments are invaluable owing to their novelty and singular form, apart from their value as metal: no prince in the world can possess such." Cf. the description of S. Ruge, 'Gesch. d. Zeitalt. d. Entdeck.,' p. 367 from Bernal Diaz and Torquemada.

** *Loc. cit.*, p. 231.

stamp-cutting and copper-engraving, which first came into general use for maps in Germany after Dürer's time.*

Other artists of that time besides Dürer were closely connected with book decoration and the illustration of maps. The school of Martin Schongauer and then Hans Burgkmair and Hans Baldung Grien should first be mentioned.† Hans Holbein was one of the foremost artists in the work of illustrating books and drawing marginal decorations. Among others the marginal decorations to the map of the world in the 'Novus Orbis' of Grypæus (1532),‡ to several maps in S. Münster's 'Ptolemæus' of 1542,§ and by some also the beautiful border to the Swiss map of Æg. Tschudi of 1538 (1560),‖ are attributed to him.

The custom of adorning maps with artistic work goes back far into the Middle Ages. The monkish maps, as those of Beatus, and at Ebstorf and Hereford, are notable examples. The maps of the world evolved from Portulans adopted the practice, and passed from the fanciful imaginations of the Middle Ages to drawings of foreign peoples, animals, etc., more true to nature. The Catalan maps, the globes of Behaim and Schöner, the world maps of Juan de la Cosa, Sebastian Cabot, and Pierre Descelliers mark the stages of this development.¶ Often this decoration served only to conceal a lack of geographical knowledge, especially in maps of Africa, of which Swift jeeringly wrote—

> "Geographers in Afric maps
> With savage pictures fill their gaps,
> And over inhabitable downs
> Place elephants for want of towns."

In the sixteenth century, however, a general tendency is observable towards removing the decoration from the body of the map into the artistic margin. Aventin's map of Bavaria ** (1525) is a good example. An endeavour was often made by combining the great possible elegance and neatness in the drawing with a beautifully designed margin to turn

* Isolated specimens of German copper-engraving are found still earlier, as, for instance, the map of Nicol. Cusanus of 1491, but in general, wood-engraving prevailed on German maps till past the middle of the sixteenth century.

† Fischer-Wieser, *l.c.*, p. 17.

‡ Thus Passavant, p. 37; but A. Woltmann, 'Holbein,' vol. 2, pp. 215 *et seq.*, is doubtful.

§ Nordenskiöld, 'Facsimile Atlas,' p. 25.

‖ Reproduced by J. F. Hofer and Burger in Zürich.

¶ Particularly fine and elegant are the maps of the Provençal geographer Guillaume le Testu (1555), studded with numerous figures, in Santarem's 'Atlas,' Abt. iv., and those of the Portuguese Vaz Dourado in the 'Atlas zur Entdeckungsgeschichte Amerikas' (1859). To these may be added the maps of Pero Fernandez, Nicolas Desliens and Diogo Homem published by V. Hantzsch and L. Schmidt, 'Kartographische Denkmäler' (1903).

** Published for the Geogr. Gesellschaft in Munich by T. Hartmann and E. Oberhummer (1899); also in the *Jahresber. d. Geogr. Ges. in München.* 1898–99 (Heft 18), pp. 83 *et seq.*, Tafel iv. (2nd edition of the Aventin map of 1533).

out a work of art worthy of the acceptance of a prince. Herein the Genoese cartographer, Giov. Batt. Agnese,* distinguished himself, who from 1517 to 1564 presided over a cartographical institution in Venice. Among his numerous Portulan atlases, of which most of the great libraries of Europe possess copies, the atlas intended for Philip II. of Spain is conspicuous by the fineness of the drawing and the beauty of its equipment.† Sometimes, however, the tendency to subordinate the map to a marginal figure degenerates into mere trifling, to the detriment of the map itself, as when, for instance, Wolfgang Lazius‡ fitted his maps of the Austrian provinces into the shield of the Austrian eagle, or Mathias Burgklehner§ forced his map of the Tyrol into the heraldic form of the Tyrolean eagle. His large map of the Tyrol in twelve sheets shows, on the other hand, the heavy ostentatious decoration of the *barocco* period, which we also meet with in the Dutch atlases of the seventeenth century, those of Jansson, Blaeu, and others. Such is also the fine world map of Jodocus Hondius (1611), which P. Jos. Fischer discovered in Wolfegg, and has lately been published by E. L. Stevenson in an excellent facsimile edition.‖

The equipment of works on regional geography, with plans and illustrations, frequently of considerable artistic merit, as was so successfully accomplished by Sebastian Münster and Matthæus Merian, is still another link in the chain connecting the art of the Renaissance with the expansion of geographical knowledge and ideas. Through it form won importance, and is now an indispensable part of geographical delineation. Eminent artists vied with one another in depicting towns, and were often surveying cartographers. Thus the versatile Nuremberg artist, Augustin Hirschvogel, about 1547 executed a ground plan and elevation of Vienna,¶ and Melchior Lorichs, of Flensburg, drew, in 1559, a view of Constantinople,** with painstaking care, and in 1568 published a map of the lower Elbe, with a view of Hamburg. A perspective plan of Constantinople, circulated from Venice, probably owes its original design to Gentile Bellini,†† and in the history of plans of Rome we come across the name of Raphael.‡‡

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* E. Oberhummer, 'Die Insel Cypern' (1903), vol. 1, p. 406, Tafel iii. and iv.

† F. Spitzer and Ch. Wiener, 'Portulan de Charles-Quint' (Paris: 1875); F. Wieser, 'Der Portulan Philipp II. von Spanien' (Wien: 1876); *Sitzungsber. d. phil.-hist. Kl. d. Kais. Ak. d. Wiss.*, Bd. 82.

‡ 'Karten der österreichischen Lande u. des Königreichs Ungarn, 1543-63,' published by E. Oberhummer and F. von Wieser (Wien: 1906).

§ 'Tirolische Landtafeln, 1608, 1611, 1620. Mit Text von E. Richter' (Wien: 1902).

‖ Map of the World by Jodocus Hondius, 1611. New York: 1907.

¶ Oberhummer, 'Der Stadtplan,' pp. 90 *et seq.*; Wolfg. Lazius, pp. 18, 23.

** E. Oberhummer, 'Konstantinopel unter Sultan Suleiman dem Grossen' (München: 1902), pp. 1 *et seq.*, Tafel i.-xxi.

†† Oberhummer, *l.c.*, pp. 21 *et seq.*

‡‡ Otto Richter, 'Topogr. der Stadt Rom,' 2 Aufl. (1901), p. 23.

The industrial arts of that period, which united a sense of beauty to the purely practical, also did not hold themselves aloof from our science. I need only refer to the artistic embellishment with which astronomical and surveying instruments were provided down to the eighteenth century, and mention that goldsmiths also took part in the execution of town pictures. In the museum at Augsburg I saw a carefully worked plan of the town in perspective, with the inscription "*Georg. Seld civis et aurif. Aug.* 1521," and in the museum at Bern plans of Lucerne (1597) and Fribourg (1606), by the "*aurifaber Martinus Martini.*"

I cannot close this review, perhaps already too long, without drawing attention to a peculiar work of the Renaissance which, though placed in one of the most frequently visited spots in the world, is yet known to few—the Galleria geografica of the Vatican. The maps of individual parts of Italy and of other lands here, executed in fresco by Father Ignazio Danti from Perugia, the excellent mathematician and cartographer of Gregory XIII. (1572–85), have never, as far as I know, been copied or described.* Unfortunately, the gallery is closed to the public, and is accessible only with a special permit hard to procure. A hurried glance round in the year 1904, and some photographs I possess, have convinced me that the maps have probably no intrinsic value, but that a reproduction, especially of the detailed maps of Italy, would be of great interest.

I here conclude this excursion through a period which was no less fruitful for geography than for art, and exhibits both in a more intimate connection than the contrast between the exact investigator and the freely creating artist would lead us to expect.

LIEUTENANT SHACKLETON'S ACHIEVEMENT.

By HUGH ROBERT MILL, D.Sc.

WHILE the preliminary notice of Lieut. Shackleton's brilliant expedition in the last issue of this *Journal* has not yet been supplemented by any additional information, and remains a sketch which can only be completed and made to glow with the colours of life when the explorer returns to tell the completed tale, there are one or two considerations which may be brought forward at this stage as to the magnitude of the step which has been made towards the solution of the Antarctic problem.

It is interesting to notice how the recent expeditions to Ross sea have been connected by personal relations between members of the

* Another series of maps by the same author may be seen in the Sala delle carde geografiche of the Palazzo Vecchio in Florence, from which the map of Switzerland has been published by A. Züricher, *Jahrbuch d. Schweiz. Alpenclub*, 76 (1890-91).

various parties. When Mr. H. J. Bull attempted to establish whale fishing in Ross sea in the southern summer of 1894–95, he was accompanied by Mr. Borchgrevink, who, failing to secure a place on board in any other capacity, shipped as a sailor, and by Captain Jensen, who, though a shipmaster of long standing, joined as mate to gratify his curiosity as to the Antarctic. Four years later Mr. Borchgrevink in the *Southern Cross*, with Captain Jensen in command of the ship, re-explored the edge of the barrier discovered by Ross in 1840, showed that it had retreated about 30 miles to the southward, landed upon it, and reached 78° 50′ in 1898, the highest southern latitude. He, first of all explorers, wintered on Antarctic land at Cape Adare, his companions including Mr. L. C. Bernacchi as meteorologist. Mr. Bernacchi, eager to continue his physical investigations in high southern latitudes, joined the scientific staff of the *Discovery* on her great voyage of 1901–1904, and here he was accompanied by Lieut. Shackleton as one of the officers of the expedition. The results of the *Discovery* expedition under the firm and sympathetic leadership of Captain Scott were to extend our knowledge of the Antarctic Regions further beyond existing experience than any previous expedition save those of Cook in the second half of the eighteenth century, and Ross in the first half of the nineteenth. Captain Scott, accompanied by Dr. Wilson and Lieut. Shackleton, made the ever-memorable sledge journey over the barrier-ice to 82° 17′, which was reached on December 30, 1902, an advance of 3° 27′ or 207 nautical miles on the previous farthest south. The long sledge expedition in terribly trying conditions of weather taxed the strength of Lieut. Shackleton, who, to his keen regret, had to leave for England before the second winter. The determination to return to the Antarctic inspired him to plan the new expedition, to raise the funds without any appeal to public sources, and, as we now know, to carry through one of the most successful polar expeditions on record. On his great journey to the South he held a course approximately parallel to that of Captain Scott, but apparently from 40 to 50 miles farther east, and in attaining 88° 23′, he improved on the previous farthest by 6° 6′, or 366 nautical miles.

There is a vast attraction in the struggle to attain an extreme latitude in polar exploration, and, although it is usual for explorers and almost invariable for critics to make little of this incitement to exploration, there must always be for the geographer a feeling that it is, after all, a very great thing to press towards the mark of latitude 90°. The tradition of inaccessibility is a challenge to humanity; and, whether it be the end of the Earth's axis or the summit of a snowy mountain which throws down this challenge, there will never be lacking a few to take it up and many to applaud the enterprise. More valuable scientific work and more lucrative commercial returns will accrue for a long time to come from easier and less fascinating adventures; but the desire to wipe

out *terra incognita* appeals more deeply to certain instincts of human nature than either science or trade, and the rough-and-ready test of highest latitude is in one sense a gauge of human progress.

The following are the historical landmarks towards the South Pole, the distances being given in nautical miles or minutes of latitude :—

Explorer.	Date.	Latitude.	Years later	Miles farther than preceding.	Nautical miles from pole.
Cook	1774	71° 10	—	—	1130
Weddell ...	1823	74° 15′	49	185	945
Ross	1842	78° 9′	19	234	711
Borchgrevink ...	1900	78° 50′	58	41	670
Scott	1902	82° 17′	2	207	463
Shackleton ...	1909	88° 23′	7	366	97

So far as we can judge, Ross reached the highest latitude attainable to a sailing ship, and, unless there are great gulfs in the Antarctic continent still entirely unknown to us, nearly the highest latitude that could be reached even by ice-protected steamers. Scott was the virtual pioneer of land exploration in the far south, and he proved in his great southern journey the practicability of the barrier surface for sledging, and in his western journey the existence of the vast plateau beyond the bordering mountains, and the possibility of reaching it and of travelling over its surface. Shackleton, basing his plans on his experience with Scott, hoped by starting much further east, from a point on the coast of King Edward Land, to travel over a surface smooth enough to allow the use of a specially designed motor-sledge. Though some minor journeys seem to have been made by a motor-car, the motor-sledge was not found practicable for the great journey to the south, nor could that journey be made from the anticipated base. The use of Siberian ponies instead of sledge-dogs, however, proved a most successful innovation; ponies were used to the point where the expedition left the more or less flat barrier and commenced the ascent of a glacier to the plateau. As a result latitude 82° 17′ seems to have been reached from White island in fifteen days, as compared with Scott's forty-eight days. Nine days more brought the party to 83° 33′, where they began the ascent of the glacier, and two days later, without making much further progress, the last pony was lost in a crevasse. From that point the sledges had to be dragged by the men themselves, but in spite of this, and in spite of the steepness of the mountain slopes leading to a plateau more than 10,000 feet above sea-level and the change to extremely bad weather, the remaining 294 nautical miles to the farthest point were accomplished in thirty-four days, an average rate of southward progress of 10 statute miles per day, and a great deal more of actual distance. Considering the difficulties, this would be accounted good work for a party fresh from their base, and was nothing short of magnificent for men who had long been on reduced

rations. This piece of journey alone was as long as Nansen's crossing of Greenland, reached a higher altitude, and when accomplished was only the turning point for a return journey of twice the length. The return journey of 625 nautical miles, measured as the skua flies, in fifty days, even though aided by strong winds and a downward gradient for a time, averaged 14½ statute miles of northing per day—a feat that we are only prevented from calling unprecedented in polar regions by the lack of data of Arctic expeditions at our hand for comparison; but as no journey was ever carried out previously in such conditions and in such a time, we must congratulate Lieut. Shackleton and his party on having set a new record of limit to human endurance.

While Lieut. Shackleton was away in the south, his colleague, Prof. David, made a journey of no less interest to the north-west, ascending to the plateau and reaching the south magnetic pole. It was Sir James Clark Ross's great ambition to reach this point; he had with him on board the *Erebus* the flag which he had previously planted on the north magnetic pole, and he felt the disappointment of failure very keenly. The fact that the position found by visiting the magnetic pole was exceedingly close to that assigned by the magnetic observations of the *Discovery* is most satisfactory.

The third triumph of the expedition was the ascent of Mount Erebus. The climbing for the first time of a peak of 12,000 feet without guides is always a notable mountaineering feat; but when, as in this case, the whole distance is above the snow-line, and the mountain is an active volcano, the feat is quite unique in interest and danger. It says much for the spirit and physique of the British and Australian members of the expedition, that these three unprecedented achievements were carried out without accident and in the limited time of one season.

Antarctic expeditions have always been singularly fortunate as compared with Arctic expeditions. No serious disaster has ever marred the success of a single exploring expedition south of the Antarctic circle, although in several cases a life was lost from accident or illness. In Lieut. Shackleton's case the risks were appalling. Again and again, in returning from the southern journey, the provisions were exhausted before the depôt left on the outward journey was reached, and the chance of missing a depôt in such a region, where wind could so easily obliterate the tracks, and where the movements of the compass are so sluggish, is by no means small. The arrival of the *Nimrod* in the nick of time to pick up the returning land expeditions was a triumph for her commander, and Lieut. Shackleton is to be sincerely congratulated on the complete success of his plans and methods, for the elaboration of which in the first place, and for carrying them into effect in the second, he himself was solely responsible.

Fuller information is required before we can estimate the value of the scientific work of the expedition. The discovery of the westward

and southward trend of the mountainous coast for 45 miles beyond Cape North is likely to prove important. Though the coast might bend northward again to run through the lands reported by Wilkes and Dumont D'Urville, it must be confessed that the new discovery makes the insular nature of those dimly seen mountains appear more probable. Of even more interest is the eastward trend of the great range of mountains bordering the plateau towards the south. One is tempted to consider the probability of the line of land forming a great bight to King Edward Land, in which the barrier lies afloat, or even to forecast the morphology of the Antarctic continent, but it is idle to speculate before all the facts are before us.

The telegrams speak with confidence of much valuable geological work by Prof. David, and of no less useful biological work by Mr. James Murray and others. The meteorological and magnetic observations made by Lieut. Adams and others cannot fail to be of value. A passage in the telegram suggests that the strong winds encountered at the farthest south tend against the theory of a polar calm; but it is worth while to point out that the theory of pressure and winds near the poles is worked out for sea-level, and would not necessarily apply to a plateau surface 10,000 feet above the sea. It is well known that a sea-level anticyclone has often a cyclonic circulation superimposed upon it in the upper air.

Lieut. Shackleton's expedition will, we believe, serve science not only by the richness of the harvest of specimens and observations brought home, but also by stimulating the revival of Antarctic exploration, and we can only wish to Dr. Charcot's expedition now in the ice, and to any others that may be sent out, a success as great and as thoroughly deserved as that which has crowned the voyage of the *Nimrod*.

RECENT PROGRESS IN GEOGRAPHICAL WORK.*

By Lieut.-Colonel C. F. CLOSE, C.M.G., R.E.

Definition of the Word "Geography."—So many definitions of the word "geography" have been proposed at one time or another, that it may be as well to begin with a brief discussion of the meaning of the term.

Dr. Mill defines geography as "The exact and organized knowledge of the distribution of phenomena on the surface of the Earth." Prof. Hettner defines geography as "The science of the arrangement of things on the surface of the Earth." Mr. Chisholm puts his definition into this form: "It is the function of geography, with respect to any class of phenomena that have a local distribution, to explain that distribution in so far as it can be explained by variations connected with place in the operation of causes whose operation varies according to locality . . . especially on human distribution, and hence on the life of man generally."†

There is yet a fourth definition which sometimes finds a place in text-books,

* Chiefly extracted from a paper in the *R.E. Journal* of March, 1909.

† See the *Geographical Journal*, January, 1909.

and not a bad one either; it is "Geography is the study of man's physical environment on the surface of the planet, and of the interaction between it and the human race." But perhaps the best short definition of geography is that given by Prof. W. M. Davis, "Geography is modern geology." This definition can be taken in a sufficiently comprehensive sense to cover all essentially geographical work.

As the outcome of some of the more extended of these definitions we have a list of terms, such as economic-, political-, military-, historical-, geography. Now, these terms cannot really be said to represent independent studies; they are rather the results of the application of geographical facts to economics, politics, the military art, and history.

Fundamental geography, as apart from applied geography, must consist in something peculiar to itself, and this is clearly the study of the surface of the Earth; all the rest is the application of this study. I am not concerned in this paper with the applications of geography.

If we analyze any essentially geographical work, we find that it involves the consideration of three interdependent sets of ideas, viz.—

(1) The study of the form of the Earth as a whole and allied problems—*Geodesy*.

(2) The study of the details of the surface features of the Earth—*Exploration*, *Survey*, and *Cartography*.

(3) The study of the origin of these features and of the changes which they undergo—*Physical Geography*.

We may say, then, that *Geography* (apart from its applications) consists of—

Geodesy.
Topography.
Physiography.

Importance of the Subject.—In view of the fact that so large a portion of this Earth's surface is British territory, we have laid upon us, above all nations, the duty of investigating these subjects, and I hope to show that this duty is not being neglected. It may serve to fix the ideas to remember that the British Empire is practically the same size as Africa. The figures, in millions of square miles, are—

British Empire	11·2916
Africa	11·3012

Geodesy.

It is impossible to attempt to do more than to illustrate by a few examples the geodetic investigations which are being carried on all over the world. I will mention only a few typical instances of such work in India, Africa, South America, and North America.

India's Contribution to Geodesy.—The chief contribution which has been made to geodesy by India, since Everest's time, is Colonel Burrard's investigation of "the intensity and direction of the force of gravity in India," in which he shows that there is a line of excessive density, a "buried chain of mountains," underlying the plains of Northern India, 150 miles distant from the foot of the Himalaya. It is not at present known to what cause this dense line is due, but the parallelism to the Himalaya indicates unity of origin. Burrard's line cannot fail to be an important factor in all discussions of the origin of that great range.

Geodesy in Africa.—In Africa the most important geodetic enterprise is undoubtedly the measurement of the arc of meridian along 30° E. This work, which was initiated by Sir David Gill in 1883, and was carried out, so far as concerns South Africa, mainly by Colonel Sir W. Morris, reached a point within 70 miles of Lake Tanganyika (working from the south) in 1907.

Another portion of this arc is at the present moment being measured. This is the portion in the neighbourhood of the Uganda-Congo boundary, stretching from 1° S. lat. to 1½° N. The party consists of Captain Jack, R.E., Mr. McCaw, and two N.C.O.'s, R.E., and their Belgian colleagues are Mr. Dehalu, of Liège, and a Belgian officer. The party began work in March, 1908, and will finish about the middle of February, 1909. This undertaking is due to a happy idea of Mr. Read, of the Colonial Office, that advantage might be taken of the presence of the Uganda-Congo Boundary Commission to use a portion of the party, after the boundary survey was finished, to measure the arc. Four learned societies have contributed towards the expenses.

The Arc of Peru.—The Uganda-Congo arc, crossing the equator, has a rival in South America, the well-known arc of Peru. In the year 1735 a French scientific expedition left France for the express purpose of measuring an arc in the neighbourhood of the equator, an arc which was to settle the question as to whether the Earth was a prolate or an oblate spheroid. The expedition returned to France in 1744–45, having completed its labours. The members were Bouguer, La Condamine, and Godin. The length of the arc was about 3° 7′. In spite of its short length it has always occupied an important place in geodetic discussions, but it has long been recognized that, from the conditions of the case, the accuracy of this old arc was not equal to modern requirements.

The French Government therefore resolved, with the consent of the Governments of Ecuador and Peru, to remeasure the arc, and confided the task to the Service Géographie de l'Armée. Work was commenced in June, 1901, and was completed in July, 1906. The length of the new arc is 5° 53′, or about twice that of the eighteenth-century arc. It is a very fine bit of work, consisting of seventy-four stations with four bases, fifty-four latitude, and six pendulum, stations.

Geodesy in the United States.—To the United States we owe in recent years (i.) many mechanical improvements in geodetic methods and apparatus; (ii.) the execution of an immense geodetic framework covering the United States (which, it may be mentioned incidentally, has been found most useful by the Militia Department of Canada, for tying on the excellent Militia Survey to); and (iii.) developments of the theory of isostasy.*

The theory of isostasy is briefly this: If the Earth is not composed of homogeneous matter, but some parts are denser than others, the figure will not be a spheroid; the denser matter will flatten the surface, and the lighter matter will bulge. The isostatic figure is thus a deformed spheroid. There is reason to believe that the deposition of sediment on the sea-floor has the effect of causing the sea-floor to sink. Similarly the denudation of the adjacent land surface is accompanied by a corresponding elevation of that surface. Captain Dutton says, "These subsidences of accumulated deposits and these progressive upward movements of eroded mountain platforms are, in the main, results of gravitation restoring the isostasy, which has been disturbed by denudation on the one hand and by sedimentation on the other." This is another matter which must be taken account of in discussing the difficult problem of mountain building.

Exploration and Survey.

It is not necessary to enter into any detailed description of the surveys going on in Africa. Briefly, so far as British territory is concerned, topographical surveys are in progress in the Cape Colony, the O.R.C., East Africa, Uganda, and Southern

* Discussed by Airy (1855) and Osmond Fisher (1886).

Nigeria, and cadastral surveys are in progress in the Gold Coast, the Anglo-Egyptian Sudan, and most of the other protectorates.

The Survey of India.—In India the principal event to chronicle is the report of the Committee on the Survey of India, which in 1904–5 investigated the whole question of the mapping of India. The Committee reported that it was necessary to make such arrangements as would ensure the topographical mapping of the whole Indian Empire of 1,780,000 square miles within the next twenty-five years. The Committee laid the greatest stress on the provision of maps for military purposes, and made recommendations for the improvement of the quality of the published maps.

As regards the recommendations of the Committee in the matters of the scales of the maps and the organization of the department, these have been the subject of much correspondence between the Government of India, the local governments, the India Office, and the War Office. A final decision is, it is believed, almost arrived at.

Improvements in Survey Methods.—Improvements in methods of survey and in instruments have their importance, but it is an importance which is commonly overrated. They are only of serious value if they render surveying cheaper, or enable work to be done which would otherwise be impossible. This criticism does not apply to photo-surveying, which, though not required for ordinary use, will occasionally enable the explorer to do things which would be otherwise impossible. The most ingenious, as well as most practical, form of photo-surveying is that devised in different ways—by Pulfrich in Germany, Fourcade in South Africa, and Captain F. V. Thompson, R.E., in England. In this the stereoscopic principle is made use of, and Captain Thompson has shown that the stereoscopic positions, in which the automatic judgment of the observer comes into play, are about twice as accurate as those determined from the same photographs by independent intersections. Moreover, by using the stereoscopic principle, it is not necessary to observe any definite object; a point may be chosen, for instance, on the side of a grassy hill, and its distance, direction, and height determined. This is strictly a new principle.

Plan of Sea Waves.—The method has been applied by Dr. Kohlschütter to making a contoured plan of a momentary position of the waves of the sea. He was the first to think of this application of the stereoscopic system, and for the first time in history we can now examine critically and at leisure the form of those waves which cause some of us so much inconvenience. A plan of this kind would no doubt be of value to designers of ships.

Improvements in Cartography.—The foundation of all modern systems of representing hill features is of course the contour, or the approximate contour. In the case of a highly accurate survey like the Ordnance Survey, the contours are actually marked out on the ground by levelling, and are fixed on paper with the same kind of accuracy as to detail. But the Ordnance Survey is, in this respect, a survey apart. In almost all other national surveys the contours are approximate only. Now, in drawing approximate contours the faculty of judgment comes into play, and the more rapid the sketching the more necessary it is for the sketcher to have an eye for hill forms.

Character in Contours.—In certain foreign maps of Africa the hill features are represented by very conventional, rounded form-lines, and we all of us know how difficult it is to read a map in which the characteristic features are not brought out. The opposite fault is more rare, the fault of over-emphasis. In maps which fail in this respect too much angularity is given to the features, and the sketch becomes a sort of caricature of nature. However, a good caricature is better than an expressionless sketch.

It is in small refinements that the difference between good and bad hill-drawing is shown. Sometimes a good deal can be learnt by reducing down photographically the contours of an accurate map. Much also can be learnt from the study of good models.

Every hill contourer should know enough physical geography to understand the different varieties of hill forms.

Legibility of Modern Maps.—There has been a marked improvement in recent years in the legibility of the printed maps. There is a general tendency to use colour freely. Many of us here can remember the time when the only maps purchasable were, in England, the engraved black 1-inch map, and in France the engraved black 1 : 80,000. Not only is improvement shown by the use of colour, but by the adoption of new methods of representing hill features and relief generally.

The most important advance in the nineteenth century was the introduction (popularized in England by Mr. Bartholomew) of the method of indicating ground between certain selected heights by special tints; maps printed on this system are sometimes known as "layer" maps.

The next step is to combine the "layer system," which shows the main features, with the shade, which is so useful for showing minor features. This was done (for the first time in a normal topographical map) in the Ordnance ½-inch layer map of England, of which the publication was commenced in 1903. It is in this direction that progress is perhaps to be looked for in the immediate future.

1:1,000,000 *Map.*—Whilst dealing with cartography it will be as well to mention the progress made by the 1:1,000,000 map. At the International Geographical Congress of London in 1895 a resolution was passed in favour of the production of maps on a uniform system on this scale. Something, but not very much, has been done by ourselves, the French, and Germans to carry out this intention. A considerable step was taken at the International Congress at Geneva in July—August, 1908. The Congress, at the instance of the American delegates, laid down in greater detail the character of the map. It was decided, for instance, that the names should be in the Latin character; that the map should be a layer map; that the contours should be at intervals of 200 metres. Many other matters were decided, and if, as is to be hoped, the countries interested adopt the recommendations and come to a complete agreement on the subject, we shall, if we live long enough, find the greater part of the Earth's surface mapped in a uniform and systematic manner, and shall be able to purchase maps of the same familiar type in every civilized country. It is a pleasing idea to think of the civilized inhabitants of this little planet agreeing together to depict its surface in a way which all shall understand.

Canada.—Before concluding this very brief sketch of some notable matters in the domain of surveying and cartography, it should be mentioned that the most important survey initiated in the British Empire in recent years is the 1-inch-to-1-mile survey of Canada, now being undertaken by the Department of Militia and Defence. This survey, commenced about four years ago, has turned out some remarkably good maps. The credit of this work is chiefly due to Captain Anderson, R.C.E. About 14,000 square miles have been completed in the field, and the work progresses at the rate of about 4000 square miles a year. The survey is at present confined to the Provinces of Quebec and Ontario.

Physical Geography.

Physiography of the Nile.—Perhaps the most important publication of recent years, especially from the practical standpoint, is Captain Lyons' account of the

"Physiography of the Nile." One of the factors dealt with in such a study is the distribution of rainfall, and this is an instance of the way in which one branch of knowledge borrows from another; but the distribution of rainfall is itself, amongst other causes, largely dependent on the character of the hill features.

All studies which do not deal with life are closely related and allied, but in order to ensure definiteness of knowledge we have to divide them into groups. All such knowledge is essentially one, but the methods of human thought requires its conventional division. The finest results of investigation are arrived at by defining, systematizing, and grouping. A science must limit its field and define its objects.

Amongst other matters in the domain of physical geography, which have attracted considerable attention lately, may be mentioned three practical subjects, viz. the transporting power of rivers, coast erosion, and earthquakes.

Matter in Suspension and Solution in Rivers.—Dr. Strahan, chairman of the Research Committee of the Royal Geographical Society, has been investigating the question of the amount of matter carried away from the land by rivers. The Medway is one of the rivers selected for examination, but the results are not yet available. I mention this question particularly to show that physical geography is largely a matter of definite investigation, as every science should be.

Coast Erosion.—The loss of land due to coast erosion is a matter which is frequently referred to in the Press, and has been recently investigated by a Royal Commission. The evidence was issued a few days ago in the form of a bulky volume. In addition to coast erosion, the Commission considered the very interesting problem of the re-afforestation of the United Kingdom, and this latter subject has rather swamped the former. However, as regards coast erosion, the evidence is briefly to the effect that in about forty years England has gained, above high-water mark, on the whole, about 30,000 acres, chiefly due to reclamation at Sunk island, in the Humber, and also in the Wash and in Morecambe bay, and also to natural accretion at Saltfleet and elsewhere. The principal erosion is on the East coast and on the Sussex coast. Curiously enough, England has lost 31,000 acres on the low-water line.

Earthquakes.—A very important branch of physical geography is the study of earthquakes, to which our attention has been especially drawn in recent years by the destruction of San Francisco and Jamaica, and only the other day by the exceptionally disastrous earthquake in Sicily and the adjoining part of Italy.

The ultimate cause of earthquakes is not known, although many conjectures have been made, but we sometimes know a good deal about the proximate cause. Perhaps the best earthquake to study is that which happened on April 15, 1906, at San Francisco.* In this case a slip occurred along an old fault. The movement was entirely horizontal, and the average slip was 11 feet, although in some cases there was a movement of as much as 20 feet. "For nearly 200 miles there is a fracture on the face of the land, and everything traversed by the fracture is dislocated, the part on the south-west side having apparently moved toward the north-west, and the part on the north-east side having apparently moved toward the south-east." In some places the line of fracture is inconspicuous, but generally it appears as a large crack. In the Report of the United States Geological Survey, an earthquake is described as a jar occasioned by some violent rupture, which may result from an explosion, but more commonly from the sudden breaking of rock under strain. "The great majority of ruptures include not only the making of a crack . . . but the sliding of the rock masses on the two sides of the crack." In the case of the San Francisco earthquake, the slip took place on the plane of an old fault. It is

* See the Reports of the U.S. Geological Survey.

obvious that when the crust of the Earth is adjusting itself under strain, the cracking and slipping is naturally to be expected on old lines of rupture.

Latitude Variation.—It has been suggested, I believe by Dr. Milne, our greatest authority on earthquakes, that there is perhaps some connection between the occurrence of earthquakes and the phenomenon of "latitude variation." But whether this is the case or not, "latitude variation" clearly indicates that the Earth is subjected to periodically varying stresses, the effect of which is that the axis of the Earth is not a fixed line as regards the Earth itself, but moves in such a way that the pole describes an irregular curve in the neighbourhood of the mean pole. Its greatest range is 0″·4, or about 40 feet. Of course this movement has been known for a good many years now. It is one which it is absolutely necessary to take account of in geodetic operations, and, as just stated, it is one to which attention must also be paid in considering the strains which may result in rupturing the crust.

Interdependence of the Three Divisions of the Subject.—And this is another illustration of the fact that geodesy and physical geography are intimately allied; and knowing how much topography depends on geodesy, and geodesy on topography, and that the study of physical geography is impossible without topography, and that it is impossible to be a good topographer without some knowledge of physical geography, we may safely say that the three are interdependent, and are in fact the three main divisions of that branch of human knowledge known as geography.

REVIEWS.

EUROPE.

The Grampians.

'The Geology and Scenery of the Grampians and the Valley of Strathmore.' By Peter Macnair, F.R.S.E., F.G.S. Vol. 1, xiv. + 195 pp., 64 Figs., 7 Maps and Diagrams. Vol. 2, xii. + 199 pp., 100 Figs., 3 Maps. Glasgow: J. Maclehose & Sons. *Price 21s. net.*

In these two handsome and finely illustrated volumes, the able Curator of the Natural History Collections in the Glasgow Museums presents an account of the geology and scenery of the strongly contrasted districts on either side of the south Highland boundary fault. This great fracture stretches right across Scotland in a north-easterly direction from the Firth of Clyde, near Helensburgh, to the North sea at Stonehaven. To the south-west it is continued into Bute, Arran, the Mull of Kintyre, and the north of Ireland.

Whilst mainly a geological work, the book will prove of great interest to the geographer, as giving an account of a region which affords ideal opportunities for the study of minor geographical problems. It is a district which, perhaps owing to its proximity to home, has not hitherto been so fully studied geographically as it deserves.

The book commences with a chapter entitled "The Cycle of Destruction and Reproduction," which presents in a popular way some of the processes whereby rocks are broken up and their *débris* transported and accumulated to form new deposits. The second chapter gives a historical introduction to the subject, in which the work of Nicol, Murchison, Harkness, Ramsay, and Geikie is reviewed. Special tribute is paid to the stratigraphical genius of Prof. James Nicol, of Aberdeen, whose early views have been in large measure substantiated by the detailed work of the Scottish Geological Survey. A general chapter on the physiography and

geology of the Grampians follows, in which the former subject is rather meagrely treated. Succeeding chapters of the first volume deal in detail with the metamorphic rocks of the Grampians, and the author's views as to their geological structure. The Grampians are the "basal wreck" of a great folded mountain chain of Alpine type, of which the anticlinorium of the Ben Lawers group is the dominant structural feature now visible. Mr. Macnair believes that the original "great central facher" or fan of the chain is now faulted down under the later sediments of the Midland valley. Only the extreme north-western limb of this is now visible in the rocks of Cowal and the shores of the Firth of Clyde. From certain passages in this part of the book (especially the sections, Fig. 44) and in the second volume, the reader is ultimately left in some doubt as to whether the anticlinorium of Ben Lawers or the faulted-down portion constitutes the "great central facher" in Mr. Macnair's opinion.

The second volume treats of the Old Red Sandstone of the Vale of Strathmore, and of the surface deposits of the whole area under consideration. The broad and fertile vale, broken by two ranges of volcanic hills, presents a complete contrast to the rugged mountains on the other side of the boundary fault. It is underlain by gently inclined beds of sandstone bent into alternations of anticline and syncline, with intercalated lavas whose escarpments form the Sidlaw and Ochil hills. Considerable space is taken up by the advocacy of the theory of the marine origin of the Old Red Sandstone as opposed to the isolated lake-basin theory of Sir A. Geikie and others. Chapters x.–xii. are occupied with a description of the igneous rocks, both intrusive and extrusive, which occur so abundantly in the district under consideration. There is a little confusion as to the age of the two main groups of great solitary dykes, one set traversing Central Scotland in an east-westerly direction, the other the south of Scotland and the north of England in a north-westerly to south-easterly direction. On p. 90, both groups are said to be connected with the [Tertiary] volcanic plateau of the west of Scotland, whereas on p. 98 many convincing reasons are put forward for considering the first group of late Carboniferous, and the second of Tertiary age.

In chapter xiii. an adequate and concise account of the glaciation of the Grampians and Strathmore is given. The figure for the growth of the Dochart-Lochay delta into Loch Tay, given on p. 148, is now twenty years out of date. The last chapter, on "Scenery in Relation to Geological Structure," gives a survey of the origin and history of the river system of Central Scotland. The sculpturing of the country has been effected, firstly, by erosion conditioned by the original south-eastern slope of the newly upheaved plateau, giving rise to transverse consequent valleys running in a general north-westerly to south-easterly direction; and secondly, by erosion along the strike of the rocks, giving rise to subsequent valleys in a south-westerly to north-easterly direction.

Mr. Macnair's book is somewhat disappointing, because of an irritating conjunction of "popular" and abstruse scientific writing. It suffers from an evident confusion of aim. If the book were written for the average non-scientific reader, the many repulsively technical petrographical descriptions, and the frequent use of other abstruse scientific terms without previous explanation, are entirely out of place. If a thoroughly scientific exposition of the subject were intended, there are too many "purple patches" of scenery description, good of their kind though they be, and too little really close discussion of the many and varied problems awaiting solution in this district.

In spite of this defect, the book is a solid contribution to the literature of this area, and may be read with pleasure and profit by all interested in its geology and scenery.

A word of praise must be given to the magnificent series of plates illustrating the scenery, and the series of folding-maps and sections. This is one of the best illustrated books we have seen for a long time.

G. W. T.

Majorca and Minorca.

'The story of Majorca and Minorca.' By Sir Clements Markham. London: Smith Elder. 1908. Pp. x., 309. *Maps. Price* 7*s.* 6*d.*

The association of these islands with the story of British power in the Mediterranean makes it desirable that an authoritative history of them should be accessible. Sir Clements Markham divides his work into two parts, dealing with Majorca and Minorca respectively. The detailed history of the former begins with the operations of King Jayme I. of Aragon against the island in the first half of the thirteenth century. It is noteworthy that this ruler left an autobiography, which serves as the principal authority for his period. In the course of his narrative, Sir Clements Markham has occasion to describe "the scenery of various localities of the island, the capital in ancient times, the mountains and caves, the towns and country houses." As a conclusion, he gives a short account of the island at the present time—its physiography, inhabitants, and conditions of life, and even some directions to intending visitors. It is hardly necessary to state that descriptions from the author's practised hand are of great assistance in studying the historical chapters. As regards Minorca, we have a similar description by way of preface, after which the prehistoric remains for which the island is noted are discussed. Turning to the historical period, it is with Minorca that British interests are associated. The island was occupied in 1707, and "secured many years of good government and freedom from oppression by her connection with her English friends." It was, moreover, the possession of Port Mahon which really established England as a Mediterranean power, giving her an outpost from Gibraltar within the sea itself.

The volume possesses all the necessary attributes of a valuable history. The maps are clear. The names of the principal authorities are quoted. There is a very full index.

AFRICA.

Madagascar.

'Neuf ans à Madagascar: Ouvrage illustré de soixante-douze planches de gravures tirées hors texte, et d'une Carte en couleurs.' Par Général Gallieni. Paris: Librairie Hachette et Cie. 1908. Pp. xvi., 362. 20 *fr.*

In this handsome and well-illustrated book, General Gallieni has given a very full account of his nine years' administration of the large island which the French declared a protectorate after their expedition of 1895, and a colony in the following year. But although they obtained possession of the ports, the capital, and some of the interior provinces, at the close of 1895 they were not masters of the country, for, before many weeks, a serious rebellion of the heathen element in the Imèrina province took place, and soon extended to many of the surrounding districts, and especially to the south and west of the island. This was an anti-Christian as well as an anti-French rising, and many native converts, as well as some European missionaries, were killed by the heathen Malagasy. After a year's time, it became evident that very vigorous efforts were needed to reduce the country to subjection; and General Gallieni, who had acquired much credit in the Tongking and other campaigns, was sent out as Governor-General and Commander-in-chief of the French forces.

In this book the general describes the steps which he took to restore order and oblige the various tribes to acknowledge the sovereignty of France; and we see how he carefully organized all the different departments of Government service—administrative, financial, posts and telegraphs, roads, bridges and forests, agriculture, mining, land concessions, educational and industrial, etc. By a number of maps and the elaborate tables of statistics given here, a very fair idea may be obtained of the present position of the island in these respects; while the numerous photographic reproductions give a clear notion of places and of people in various parts of the country. Great material improvements have been made; good roads now connect the ports with all the chief towns of the interior; there is an excellent postal and telegraph service; industry, agriculture, and various manufactures have been promoted, as well as the breeding of horses, sheep, and cattle; a railway from the east coast now connects it with the capital; industrial and medical schools, hospitals, and dispensaries have been erected; and the chief town, Antanànarivo, has been made a handsome city, with well-paved roads, small parks and gardens, and numbers of well-constructed houses and public buildings.

Notwithstanding these advances, there seems room for improvement. The taxation seems far too heavy for the resources of the people. The large army of officials, both French and native, seems in excess of all real needs of government, especially among a simple-living people like the Malagasy; and the various monopolies granted to French colonists appear vexatious interferences with old liberties of the people. Several manufactures which had been commenced, both by French and Malagasy, have been abandoned on account of the heavy taxes put upon them as soon as they began to be productive. Almost all foreign trade is now shut out by the heavy protective duties on all but French products. And since General Gallieni's retirement in November, 1906, hundreds of mission day-schools have been closed, where the children received a fairly good education at a very small expense to their parents.

General Gallieni's book almost entirely ignores the great work—civilizing, educational, and beneficent—which had been carried on for many years in Madagascar by missionary societies previous to the French conquest. It must be remembered that it was the heathen tribes who rebelled and cost France a campaign lasting for four or five years; while the Christianized people loyally obeyed the laws and gave no trouble to their conquerors when they had once submitted. It was from these latter also that all the writers, interpreters, doctors, nurses, and minor Government officials were obtained when the general commenced the organization of the new colony. These are "lines left out" of an otherwise useful contribution to our knowledge of the modern history of Madagascar. J. SIBREE.

THE CENTRAL SAHARA.

'Nos Confins Sahariens. Etude d'Organisation Militaire.' Par le Capitaine E. Arnaud et le Lieut. M. Cortier. *Maps, Diagrams, and Illustrations.* Paris: Emile Lârose. 1908. 12 *fr.*

As its title indicates, the greater part of Captain Arnaud and Lieut. Cortier's book is occupied with a detailed study of the military organization established by the French in the Central Sahara. The gap between the Algerian and West African outposts has been closed, and along a fairly broad band of desert peace is maintained by means of the "new model"—the mobile companies of *méharistes* (men mounted on swift camels) substituted for the horse and foot soldiers of the "old" days, that is, of days so recent as 1900–1. It has been only since the French admitted that the Sahara had conquered them, and abandoned their clumsy European methods of warfare, that they have been able to conquer the Sahara, or

more correctly, part of its central portion. The authors of this book show how the new military methods used in the desert are such as the nature of the country dictates. The appeal of their book is, however, far from exclusively military. They describe successively the geographical, economic, and political aspects of the Algerian and West African hinterlands. This is done in an extremely able and lucid manner. An account is likewise given of the journey across the Sahara made by the authors in 1907. During the journey Lieut. Cortier determined astronomically the position of many places, and 750 miles of new routes were traversed. Captain Arnaud crossed from Algiers to Kotonou (Dahomey), over 3000 miles by the route followed, in 127 days. The new routes taken were all in the region between the Wad Arak (south of Insalah) and Gao on the Niger, and principally in the district called Adrar Orientale, or Adrar Iforass, from the name of its chief inhabitants. Here Lieut. Cortier remained after his chief had gone forward and made important investigations, while later, at Gao, "copies were made of all the historic documents known concerning Adrar Iforass." The lieutenant's studies on this country are to be published separately. In the present book maps are given of the route taken by the mission. Moreover, sufficient material has now been collected for an approximately final map as to main features of the Sahara between Taodenni on the west and Agadez on the east. Four years ago "Stieler's" map (by B. Domann) showed nearly half of this area blank. The gain to science is perhaps the greatest gain which results from this opening up of the Sahara by France. Economically, the country seems to be, as Captain Arnaud frankly admits, valueless; it will certainly not directly repay France the cost of conquest. But as a highway between the rich lands of the Niger bend and the Western Barbary states it has its uses for other than its Berber and Arab inhabitants; and France must be thanked for making the highway safe. This work is so interestingly written that we anticipate with pleasure Lieut. Cortier's book on Adrar Orientale. May that book be as finely illustrated as is the volume now noticed.

F. R. C.

Morocco.

'Etude sociale, politique et Economique sur le Maroc par Gustave Jeannot, docteur en droit.' Dijon: Jacquot et Floret, 1907. Paris: A. Challamel. 8 *fr.*

Dr. Jeannot's study of the Moroccan question appeared at the end of 1907. The time that has since elapsed does not detract from the value of the book, for changeable as are current affairs in the country described, the factors essential for a right understanding of the problem do not alter. In the methodical manner in which French writers love to develop their thesis, the author divides his subject into physical geography, history, *le milieu marocain*, political organization, and economic geography. The information is general rather than particular, and Dr. Jeannot's authorities are almost all recent, and French; he shows himself, however, well acquainted with his subject, and from his pages a very fair idea of the state of the country and the problems awaiting France in Morocco can be gathered. The author rightly dwells on the intimate relation between geography and history; his special point being that no invasion of Morocco from the sea has been successful or is likely to succeed. The plainsmen, when attacked, fall back upon the mountains, where dwell the most virile of the Moroccan peoples. The defensive force thus concentrated presently descends like a cyclone upon the plains, sweeping away the invader. Such, at least, has been the programme in the past. The *bouche du Maghrib* is found in the Taza pass, in the breach between the Riff and the Middle Atlas. It is the route followed by most (though not all, as Dr. Jeannot imagines) of the conquerors of Morocco; it has for France the advantage of leading from

Algeria into the heart of the country, passing by the valley of the Innawen to that of the Messwan, the Sebu, and the Mulwiya. The mountains are, as it were, taken in flank. It should also be noted that Dr. Jeannot is a strong opponent of French penetration by any save pacific means, and that he holds it to be essential that the French should work in and through the spiritual power exercised by the Sheriffean dynasty, Islam being the one cohesive element in the misnamed Moroccan Empire.

F. R. C.

The Basin of the Shari and Lake Chad.

'Etude sur le Tchad et le Bassin du Chari.' Par Captaine H. Freydenberg. *Illustrations and Sketch-maps.* Paris: Fernaud Schmidt. 1908.

Captain Freydenberg's book is a careful collation of the facts known concerning Lake Chad and the basin of the Shari. To some extent it is based on his own observations, made in June—August, 1905. It is, we believe, the first attempt to deal comprehensively with the subject. It is necessarily provisional, for the region is still imperfectly known. Moreover, the author has ignored the work of all non-French travellers since the days of Nachtigal. There is not a word about German explorers in the Cameroon hinterland; not a word about the survey of Lake Chad by Boyd-Alexander and Talbot. This last omission is distinctly strange, as the English travellers' survey immediately preceded the journey of Captain Freydenberg, and Boyd-Alexander's book was published while the French writer was preparing his work. The general result of Captain Freydenberg's study is to confirm the conclusions of other recent travellers. Chad, he says, is not primarily one lake, but several (he enumerates five), which at favourable seasons unite to form the *Grand Tchad* such as was seen by Denham, Clapperton, Overweg, and Barth. This favourable season depends on the floods in the Shari, Yo, and other affluents being "synchronous and sufficient," when the "barrage" separating the Shari lake and the Yo lake is inundated. In 1905, according to the author, the lake was at the end of a dry period; apparently "one of those periods of almost complete drying up which succeed a considerable inundation." Yet that there has been a permanent shrinkage in the lake area since 1822 seems to have been proved. The author deals successively with each district of the basin of the Shari. His information is given concisely and clearly, and is most valuable concerning the north-east regions, where French officers are continually decreasing the area of unknown land. Besides the chapters devoted to orographic, hydrographic, and geological details, there are complimentary chapters on meteorology, flora, fauna, and ethnology.

F. R. C.

The Vegetation of Africa.

'Die Pflanzenwelt Afrikas insbesondere seiner tropischen Gebiete.' Von A. Engler. II. Band ('Die Vegetation der Erde'). Leipzig: W. Engelmann. 1908. 18*m*.

In that valuable collection of plant geographical monographs, "Die Vegetation der Erde," edited by Engler and Drude, Engler's new work promises to be of exceptional interest. Even as geography now extends its field across the distributional part of biology, so one notices increasingly how in return systematic botany is vivified by the geographic idea—witness the arrangement of the botanic gardens at Dahlem-Steglitz, near Berlin.

Works of the type given in the "Vegetation der Erde" cannot be overlooked by the geographer. Only one instalment of Engler's Monograph of Africa has appeared, and that exclusively systematic. But the plan of the whole work is already published.

We may look forward with the keenest interest to the first and fifth volumes. The former will develop the floristic distribution, and the latter or fifth part will contain the ecologic geography along with the evolution of the African flora.

In the present account of the monocotyledonous character plants of the Dark Continent, one cannot fail noticing an interesting departure in this class of work, namely, the geographic arrangement of the chief natural orders. The grasses, for instance, are grouped according to the landscape where they belong: rain-forest, savannahs, mountain pastures, and others. Hence, at once the physiognomic differences appear strikingly. Similarly, the photographs no longer give the individual plant, but the plant society of which it is a member. Apart from these few points, which still repay a perusal of the book, its interest is rather specialized.

M. H.

AMERICA.

The Topographical Map of Canada.

'Topographic Map.' Intelligence Branch, Department of Militia and Defence.—Scale 1 inch to 1 mile. Sheets: Brockville; Dunnville; Fort Erie, Grimsby; Kemptville; Mallorytown; Merrickville; Morrisburg; Niagara; Ottawa; Russell; Welland; Winchester.—Scale ½ inch to 1 mile. Sheet: Niagara peninsula.

'Standard Topographical Map.' Department of the Interior.—Scale 1 : 500,000. Sheets: Lake Nipigon; Rainy river; St. John.—Scale 1 : 250,000. Sheets: Cape Breton; Guelph; Hamilton; London; Timiskaming; Toronto and Muskoka.

The existence of two sets of maps covering the same area, and each claiming to be a genuine topographical map, is a phenomenon which invites curiosity. Most countries can barely afford the expense of a single map of the territory lying within their boundaries; what are we to judge of the wealth and prosperity of a nation which is actually in a position to employ two independent government departments upon the task of producing and publishing maps of the same piece of country, and can spend large sums of public money upon these rival undertakings?

If these two maps were in any sense complementary, if one supplied information that was lacking in the other, if the methods of representation of the features were different so that each map found its particular sphere of usefulness, we might be inclined to congratulate the government and people upon their possession, though we should still be of opinion that their dual manufacture had been unnecessarily costly. A short examination of these particular maps will, however, show small grounds for congratulation.

It will, doubtless, be an unwelcome surprise to many of our readers to learn that the map issued by the Department of the Interior under the title of the "Standard Topographical Map," is not, in any real sense of the words, a topographical map at all. It is not based upon a triangulation or other accurate fixation of points; it contains no representation of the form of the ground, neither contours, hill shading, nor heights; the natural water features are only approximately sketched in; and the colouring is according to political divisions. It is, to all appearance, a map compiled from land survey plans, such as we are familiar with in many of our colonies, and such as serves a useful purpose until a proper survey map is made. To continue its production after a real map is issued is a remarkable piece of public policy for which we believe a somewhat similar procedure in France offers the only well-known precedent. We cannot but regret that Canada should have followed this example. We are, however, not here concerned with questions of policy, nor do we pause to lament a waste of public money; what, as geographers, we are concerned with, is the fact that an important Government department in the great Dominion should issue a map with a misleading title.

Apart from mere misdescription and regarding this map only as a compilation, it presents faults which, even supposing no other map existed, would greatly impair its usefulness. We may enumerate some of these.

It has no reference-table giving the meanings of the conventional signs used; we presume that the black network lines covering most of the land are property boundaries, though we are left in doubt as to whether they are fences or imaginary lines upon the ground, and the series of Arabic and Roman numerals are, of course, quite incomprehensible to any one not acquainted with the Canadian land system. No distinction is made between different kinds of roads, the unmetalled track leading to a farm being shown by the same double black lines as a metalled highway.

Should any doubts remain as to the defects of this map, such can be completely removed by a side-by-side comparison of one sheet with the corresponding sheet of the "Topographic" map, published by the Department of Militia and Defence, say, for example, the "Toronto" sheet of the "Standard" map, and the "Niagara Peninsula" of the ½ inch to 1 mile series. In no way can we avoid the conclusion that the "Standard" map is, as compared with the topographical maps of most nations, a production of small value, and that by a stoppage of further expenditure upon it, the Canadian Government would lose little, while effecting a substantial economy in public expenditure.

The "Topographic" map is in every way a most complete contrast. It is based partly upon a precise triangulation and partly upon accurate traverses; it shows the ground forms by contours run from lines of spirit-levelling; it indicates all the natural and artificial features, water, woods, roads, metalled and unmetalled, railways and houses. In short, it is a true topographical map based upon a complete survey, and showing all details that can conveniently be represented upon the particular scale selected. It is well reproduced in four colours, and follows in general, both in methods of survey and in style of printing, the well-known 1:62,500 and 1:125,000 sheets of the United States. The sheets are, however, of different size, and the woods are more completely shown than on most sheets of the United States map.

It is at present published on two scales—1 inch to 1 mile and ½ inch to 1 mile, the latter again being issued in two forms, one with relief shown by the layer system, and one with contours only.

It reflects great credit both upon the department concerned and on the officers and others employed on the actual work. Should financial considerations permit we trust that the government will be able to increase the monetary grant to an organization which has proved itself so efficient. Canada is a large country, and in any case many years must elapse before even the closely settled areas are completely mapped.

E. H. H.

The Canadian North-West.

'Through the Mackenzie Basin.' By Charles Mair. Toronto: Briggs. 1908. *Map and Illustrations.*

The first and principal part of this handsome volume is "a narrative of the Athabasca and Peace River Treaty Expedition of 1899," of which the leader was the Hon. David Laird. The author, Mr. Mair, was the English secretary of the half-breed commission. An introduction gives the historical retrospect necessary to the understanding of the treaty, beginning from 1857, when exploring expeditions were sent to the North-West, under Captain Palliser and Prof. Hind, and other important steps were taken towards the annexation of the territory. Then follow the negotiations which led to the transfer of the Hudson Bay territories, together with

a survey of the negotiations and treaties made with the Indians before 1899. The narrative of the journey of the commissioners has been delayed in publication, partly, it appears, because it was thought desirable not to extend too widely a knowledge of the country until means of communication had opened it up to settlers. The journey of the commissioners, which involved many days of "tracking," or poling their boat against heavy streams, was beset with many difficulties, and not a few dangers. It is simply but clearly described by Dr. Mair, who has also many interesting notes on the country through which the commission passed. The meeting with the Indians and the verbal negotiations with them are fully narrated, and do not lack picturesqueness. Finally, a second part of the volume is devoted to notes on the mammals and birds of Northern Canada, by Mr. Roderick Macfarlane, formerly chief factor of the Hudson Bay Company. These notes are appropriately associated with the narrative of the commissioners' journey, though they are not, of course, an outcome of that journey, but of observations extending over a long period of residence and travel in the North-West.

The narrative portion of the journey is illustrated with photographs, not, indeed, to be classed very highly as examples of the art, but in some instances showing far more clearly than words the nature of the difficulties of river-travel.

O. J. R. H.

Southern Mexico.

'Through Southern Mexico.' By Dr. Hans Gadow. London: Witherby. 1908. 18*s. net.*

"This narrative is based upon two journeys through Southern Mexico, during the years 1903 and 1904. Eight months—most of them spent in roaming about, off the few tourist tracks, through some rather wild and little-known districts, from the region of snow down to the sweltering tropical lowlands—afforded more than hasty impressions of this wonderful country."

The book takes us first along the foot of the steep eastern slopes of the high Mexican plateau from Cordoba down to the isthmus of Tehuantepec, amid landscapes of tropical rain-forests, savannahs, and scrubs. And all the way we are favoured with short but truly representative glimpses into the life of the "tierra caliente." After rapid excursions to the lagoons east of Tehuantepec and to Salina-Cruz, comes a laborious ride up and down the dry cañons of the Sierra Madre.

The second great trip was made in the hilly and extremely varied land of Guerrero and the valley of the Rio Balsas down to the lagoons of the Pacific shore, returning to Chilpancingo, that unfortunate town which, as will be remembered, was twice destroyed since by disastrous seisms. The purely narrative part is dotted over with special chapters—each a scientific yet popular monograph on such widely varied topics as the peculiar newt of Lake Xochmilco, near Mexico City, the Agave and pulque, leaf-cutting ants, the jigger or sand flea, rattle-snakes, Aztec civilization and origins, vampires, Mexican diseases and others.

Dr. Gadow's is by a long way the ablest book written on modern south Mexico. It is indeed refreshing, after the mass of indifferent literature on that country published in recent years by untrained tourists, to find a work written in the true Darwinian vein and uniting strictly scientific, first-hand information with a great charm and truthfulness of narrative. The writer generally gives an extremely fair and sympathetic interpretation of the state of affairs in the country. He has made a serious and far from unsuccessful effort to understand the people and their ways, and see things with the eye of the evolutionist. His good-humoured criticisms are by no means exaggerated, and the writer must be congratulated for preserving an unbiassed mind in spite of his frequently associating with the official world.

It is hardly fair, then, to point to a very few curious statements. Those who

have lived in the country will be rather astonished to hear that pulque-drinking is restricted to the male part of the population of the high plateau, and that bad language is rare. Also it will come as a surprise that the "mal del pinto" is confined to the Pacific slope. For it is known in the heart of the hills on the Gulf slopes. Again, one may be pardoned for a mild scepticism regarding the interpretation of some of the Aztec hieroglyphs which appear in the tail-pieces and other etymologies.

The absence of a map that would enable us better to understand the nature of the country is rather to be regretted. There exist a few decent maps of Oaxaca and Guerrero.

From the difficulties experienced only six years ago along the Tehuantepec railway, one will better appreciate the enormous progress realized in that and other parts of the country. M. H.

South America.

'Notes of a Botanist on the Amazon and Andes.' By Richard Spruce, PH.D. Edited and condensed by Alfred Russell Wallace, O.M., F.R.S. With a biographical Introduction. *Portrait, 71 Illustrations, and 7 Maps.* Pp. 518 + 542. 2 vols. London Macmillan. 1908. 21*s. net.*

The second title of this work is as follows: "Being records of travel on the Amazon and its tributaries, the Trombetas, Rio Negro, Uaupés, Casiquiari, Pacimoni, Huallaga, and Pastasa; as also to the cataracts of the Orinoco, along the eastern side of the Andes of Peru and Ecuador, and the shores of the Pacific, during the years 1849–1864."

Richard Spruce is well known to the botanical world as the author of a classical monograph on the Hepaticæ of the Amazon and the Andes, a work far in advance of the period at which it appeared, and which will probably remain the standard treatise on the subject for many years to come. He also published many other papers of importance. Most unfortunately, from 1864 until his death in 1893, the continued ill health from which he suffered prevented him from working out the many valuable observations which are scattered through these two handsome volumes.

If one remembers the date at which these notes were made, it is astonishing to find how clear and definite were his views on many modern subjects. The reader is advised to begin with the second volume, which contains certain valuable articles which had been more or less prepared for publication. The sketch of the vegetation in the Amazon valley, the chapters on migrations of insects, birds and fishes; on narcotics and stimulants; on the historical existence of women warriors or Amazons; on the picture-writing of the Indians; and on Valverde's story of hidden treasure (which, according to Spruce, may yet be discovered), are all of great scientific and historical value.

In the journals, extracts from note-books and private letters, which make up the first and a considerable part of the second volume, there is much that will interest intending travellers. He went through many dangerous experiences in these extensive explorations of the Amazon valley and its tributaries, as well as of Peru and Guayaquil.

The story of the collection of plants of *Chinchona succirubra* (red bark), one of the most valuable species of the quinine plants, and the one which yields the largest percentage of all the alkaloids, was a very important public service. The account of it is a romance in itself, and contains many valuable suggestions as to the climate and conditions under which these plants should be grown. There is also a vivid account of those uncanny ants who occupy, and one might almost say overawe, the whole of the Amazon valleys.

His description of travel-adventures, of animals, birds, characteristics of the

inhabitants, etc., are almost photographic, but yet they are tantalizing, for they were not intended for publication, and one is always trying to find out what he really believed upon many interesting subjects. It is clear that his notes were chiefly intended for his own use. Being a most enthusiastic collector in a botanist's paradise, his accounts of the flora are often more suitable for private letters to Sir W. Hooker and Mr. Bentham than for the general reader.

Amongst the many points of special geographical interest, are certain original observations on the volcanic rocks of the Amazons. Mr. Wallace, in giving a short summary of the geology as explained by recent explorations, points out that these observations throw much new light on the subject.

Another very interesting question relates to the great annual inundation of the river Amazon. A broad stretch of forest is overflowed and remains under water for months. On its outer edge this *gapo* or inundated forest mingles with and is scarcely to be distinguished from the "Great Forests" on fertile land above the flood-level. But its flora is quite characteristic and altogether different. In it one finds certain rubber trees, bushes inhabited by "fire" ants, peculiar palms, and other special plants. On the river-side, in the dry season, one finds a narrow fringe of salix and then a broad stretch of mud before one comes to the water's edge.

Both rise and fall of the "white," that is silt-laden, water, is gradual, gentle, and almost insensible. It is obvious that one has here a tantalizing glimpse into a great process of "filling up," by which the valley of the Amazons may in the end become another pampas like that of the La Plata. During the ebb, great portions of the bank, with trees growing on them and which have been undermined, fall into the water. On one occasion he found the entire breadth of the river obstructed by an entanglement of logs and branches.

His observations on the grass islands remind one of the Nile sudd, of which so much has been written recently. The masses of grass are torn away from the muddy bottom during the rise of the inundation, and float out into the stream when the water begins to fall. The two grasses of most importance are *Paspalum pyramidale* and *Panicum spectabile*, of which last Spruce found a specimen 45 feet long and with roots from each of its seventy-eight "joints." The other floating plants concerned are curiously similar to those found both in the Nile and in the Ganges.

Many of Spruce's observations are confirmed and extended by Dr. Ule's recent work on the same district. There is a clear account, for instance, of what we would now call the "vicarious" or corresponding species in different districts. The history of the very valuable paper on ant-agency is a disheartening example of how even distinguished scientists cannot divest themselves of dogmatic orthodoxy and on purely scientific subjects. It is a brilliant and original paper, and though it has awaited publication for some forty years, it is still of great importance to the theory of evolution.

Spruce, for the sake of his health, paid a visit to the northern desert region of Peru, and the valleys of Puira and Amotape. His description of the desert and its scanty vegetation is most interesting, and he added a valuable account of the cultivation of Peruvian cotton, with botanical descriptions. He was indefatigable in his philological researches, making a full vocabulary and grammar of the Jupi language, and collecting the only list we have of words of the almost extinct language spoken at Eten and Sechura on the Peruvian coast.

He also diligently collected the folklore, especially while in the Huallaga region. His story of the "Salto de Aguirre," gathered from the people of Tarapoto, is an interesting tradition founded on fact. Though his chief work was botanical, his researches were many sided, and in this respect he comes nearer to Humboldt than any other traveller of the last century. G. F. S. E.

The Pelée Catastrophe.

'The Eruption of Pelée.' By Angelo Heilprin. Published for the Geographical Society of Philadelphia by J. B. Lippincott Company. 1908.

This beautiful volume contains the last words of the celebrated American geographer and lecturer on the volcanic eruptions in Martinique, in which he, perhaps more than any other writer, had stimulated popular interest for several years. It is illustrated by a large number of photographic plates, most of which have appeared already in the author's books on Montagne Pelée, but some of them are new. The accompanying text gives a *résumé* of the observations he had made during repeated visits to Martinique, and an outline of the results of his last expedition in 1906, when he found the crater in a comparatively quiescent state, and was able to examine closely the ruins of the great obelisk which once had occupied it.

Prof. Heilprin's name is associated with his daring expedition to Martinique in May, 1902, immediately after the great catastrophe in which St. Pierre and its thirty thousand inhabitants were destroyed in a few minutes. He was the first to climb the volcano and obtain a glimpse of the interior of the crater, and later in the same year he had a very narrow escape from death on August 30, when nearly two thousand inhabitants of the eastern slopes of the mountain were suddenly killed in the night by the descent of a burning cloud from the crater.

The book bears the stamp of the author's mind in every paragraph: his great erudition and the enthusiasm with which he collected information from all sources regarding volcanic eruptions and those of Pelée in particular are very impressive. Still more, perhaps, are we conscious of the fascination which everything that was picturesque, horrible, and unexpected in the volcanic phenomena of these remarkable eruptions exerted over his imagination. We get a series of brilliant word-pictures linked with speculations of the most daring kind. Compared with Prof. Lacroix's classic monograph on Pelée, the result of many months of patient research, this book appears a mere sketch, though a very graphic one. The author seizes on those details which will arrest attention and stimulate wonder. The magnetic and tidal disturbances, atmospheric phenomena, and sound effects of the eruptions are gone into at considerable length. One of Prof. Heilprin's most original suggestions was that the great rock pillar which rose from the crater of Pelée, and at one time towered 1000 feet above the lowest portion of the crater's rim, was an old volcanic plug or "neck" which had been dislodged from its base and borne upwards by the ascending magma of the recent eruptions. Though remarkably ingenious, this hypothesis has found little favour, and what we know of the petrography of the column and of its recent history (it has now crumbled down to a mere ruin) has not served to render it more probable. We lay down the book with a sense of regret that a writer so stimulating and attractive, so cultured a type of the strenuous American, should have been lost to science at the early age of fifty-five years.

J. S. F.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

The Protection of Nature.

'The Care of Natural Monuments, with special reference to Great Britain and Germany.' By H. Conwentz. Pp. x. + 185. Cambridge: University Press. 1909. *Price* 2*s* 6*d*. *net*.

A lecture delivered before the British Association in Leicester in 1907 forms the substance of this small volume, in which the author, who is Prussian State Commissioner for the Care of Natural Monuments, makes an appeal for the registration

and protection of existing features of natural beauty or of scientific interest. Fine scenery, characteristic soil formations, interesting associations of plants, nesting places of birds, and rare species of indigenous flora and fauna, are all embraced in his appeal; yet wide as is his definition of natural monuments, he does not seem to include within the scope of the term races which are on the verge of extinction. The greater part of the book is occupied with instances of what is being done in various countries, but chiefly Britain and Germany, to protect natural monuments either by private effort or by state legislation. This part might with advantage be amplified. For instance, we find no mention of our Wild Birds' Protection Act. While the author is generally convincing, one cannot help feeling that in certain cases his objections are more sentimental than rational. To object to the "falsification of the original character of the vegetation of Table mountain through the introduction of Mediterranean conifers" does not seem reasonable. These conifers undoubtedly add to the charm of the woods above Cape Town. With equal justification one might criticise the introduction of the Australian eucalyptus into the French Riviera, where these trees now form one of the most pleasing features of the vegetation.

The lecture ends with some suggestions for future action which the author thinks should arise from private initiative rather than state action. He suggests that a committee of the British Association should organize and direct the record and mapping of all our natural monuments. This he believes would stimulate popular interest and lead to protective measures.

The book is certainly useful as far as it goes and is worthy of extension into a larger volume.

R. N. R. B.

SHORT NOTICES.

Europe.—'Harrison's Description of England in Shakespere's Youth. Second and Third Books.' Part iv. Edited by Frederick J. Furnivall, with additions by Mrs. C. C. Stopes. (London: Chatto & Windus. 1909. 17*s.* 6*d. net.* Paged from 197 to 427.) This volume completes the work begun many years ago by the New Shakespere Society, Dr. Furnivall having edited it from the first two editions of Holinshed's Chronicle (1577 and 1587). It contains extracts from a number of works, most little known, a few comparatively familiar. Of these the most noteworthy in the geographical connection are the 'Notes on London Churches and Buildings,' by "An Old Man" (1631–1658); extracts from 'Fynes Moryson's Itinerary' (1617); extracts from 'Coryat's Crudities' (1611); and John Bishop's account of the state of the Thames in 1580–1585.

'The Itinerary of John Leland.' Parts vii. and viii. Edited by Lucy Toulmin Smith. (London: Bell. 1909. Pp. x., 216. *Maps.* 12*s.*) In this volume, Part vii. continues Leland's narrative. Part viii. consists of notes on Kent, both from the 'Itinerary' and from the 'Collectanea.' It also contains "miscellaneous notes of gentry and their possessions, . . . and some . . . referring to incidents and events of recent history." Three appendices contain a variety of notes on various localities and other matter, with facsimile maps of eastern Yorkshire and Lincolnshire, and of the Channel islands. The volume is no less excellently produced than its predecessors.

'In Viking Land.' By W. S. Monroe. (London: Bell. 1908. Pp. xxiv., 332. *Map and Illustrations.* 7*s.* 6*d.*) This is a book of considerable if not striking value, by an American author. It does not contain much that is new, but it is of use as a book of reference, for it is not merely a collection of travelling impressions, but a survey, geographical, historical, and ethnographic, of Norway,

and while by no means exhaustive, it covers a good deal of ground. It is fairly well illustrated, but the map is peculiarly bad, with many incorrect spellings.

'Pisa' ("Mediæval Town" Series). By Janet Ross and Nelly Erichsen. (London: Dent. 1909. Pp. xii., 418. *Maps and Illustrations.* 4*s.* 6*d.*) The "Mediæval Town" series is so well known and deservedly admired that it is only necessary to say that the present volume maintains the standard of the series. An interesting feature is the reproduction of a map of Pisa, reputedly of the ninth, but more probably of the thirteenth, century, or later. Miss Erichsen's drawings are delicately beautiful and well reproduced.

'My Life among the Wild Birds in Spain.' By Colonel Willoughby Verner. (London: Bate & Danielsson. 1909. Pp. xvi., 468. *Illustrations.* 21*s.*) This is a sumptuous and most interesting volume. It should appeal to many readers beyond scientists, for though every page shows the author to be a learned and careful ornithologist, the scientific aspect of his work does not exclude more general interests. The author's many adventures are narrated in an entertaining manner, and geographers should be attracted especially because Colonel Verner's researches led him to visit and examine minutely certain parts of Spain which are very little known to foreign visitors.

'A British Officer in the Balkans.' By Major P. E. Henderson. (London: Seeley. 1909. Pp. 302. *Map and Illustrations.* 16*s.*) This volume is somewhat curiously named. It might be expected from its title to be one of those narratives of travellers who have viewed the condition of Turkey in Europe from the military point of view in connection with the Macedonian and kindred questions. As a matter of fact, it is a simple narrative of travel on the Dalmatian coast, on the road from Cattaro to Cetinje, in Herzegovina and Bosnia, and in Hungary. It affords interesting reading in a general way, being vividly written and well illustrated.

Asia.—'The Witness of the Wilderness.' By the Rev. G. Robinson Lees. (London: Longmans. 1909. Pp. xii., 222. *Illustrations.* 3*s.* 6*d.*) This small volume contains a study of the Bedouin—"their origin, history, home life, strife, religion, and superstitions, in their relation to the Bible," as the sub-title runs. The author is well qualified for his task through personal contact with the race, and, furthermore, has obviously studied other authorities closely. Copious Biblical references are provided.

'India' ("Romance of Empire" Series). By Victor Surridge. (London: Jack. 1909. Pp. xiii., 308. *Map and Illustrations.* 6*s.*) Mr. Surridge has successfully caught the style of this well-known series. There is no attempt at a comprehensive history of India, which would indeed be impossible in the compass of a single volume if any attempt were made to preserve picturesqueness. Instead, a few of the most romantic incidents in the building of the Indian Empire are cleverly welded into a consecutive story, and the effect is heightened by some effective drawings in colour by A. D. M'Cormick, R.I. In this, as in other volumes of the series, romantic narrative seems sometimes to demand a somewhat colloquial tone.

America.—'Along the Labrador Coast.' By C. W. Townsend. (London: Fisher Unwin. 1908. Pp. xii., 289. *Map and Illustr.* 5*s. net.*) This is a charming volume of its kind. It is a simple account of a comparatively simple trip, but so freshly given, and with such a wealth of picturesque detail, that interest is never lacking. The author was primarily concerned in the study of bird-life, and this subject has a prominent place. The appreciation of Dr. Wilfred Grenfell's work is of special interest to English readers.

'The Making of Canada.' By A. G. Bradley. (London: Constable. 1908. Pp. viii., 396. *Maps.* 12*s.* 6*d.*) Those who are acquainted with Mr. Bradley's

'Fight with France for North America' will need no further invitation to study the present volume, which is practically a sequel to it. The bulk of the work is concerned with the first half-century of British rule. The story is lucid and well balanced; the book is carefully indexed, and a word should be given to the particular excellence of the printing.

'A Guide to the West Indies and Bermudas.' By Frederick A. Ober. (London: Fisher Unwin. 1908. Pp. ix., 509. *Maps and Illustrations.* 8s. 6*d. net.*) This appears to be a thorough guide of the less formal kind; it is possible to read it with satisfaction from the literary point of view. Each part, however, is divided into titled sections, which make for ease of reference. The American maps are not quite satisfactory, but the production is otherwise good, and, in spite of its large number of pages, the book is compact and light.

'Peru: its Story, People, and Religion.' By Geraldine Guiness. (London: Morgan & Scott. 1909. Pp. xxiv., 438. *Maps and Illustrations.* 7s. 6*d.*) The main object of this book, by an authoress who possesses an intense interest in missionary work, is to show "the conditions of spiritual destitution" in Peru. Incidentally, however, she has much general information to give as to the country and its story, and the book is beautifully illustrated. The style is perhaps somewhat forced, but shows the writer's interest in her subject. A glossary and bibliography are furnished.

'A Pleasure Pilgrim in South America.' By C. D. Mackellar. (London: Murray. 1908. Pp. xii., 408. *Illustrations.* 15s.) This is a collection of letters recording the writer's impressions of a tour in South America, principally in the west. If it must be said that they would have borne some editing for style, it must also be acknowledged that their tone of intimacy gives them additional interest. The author evidently found a specially congenial subject in the remains and history of the Incas, visiting several of their sites, which he describes and illustrates.

General.—'The Atmosphere' and 'Volcanoes and Earthquakes.' By Prof. E. J. Houston. ["Chambers' Wonder Books" Series.] (London: Chambers. 1908. Pp. vi., 326, and viii., 369. *Illustrations.* 3s. 6*d. each.*) In these volumes there is a vast quantity of information covering the widest field compatible with their titles. For instance, in the volume on the atmosphere we find two such diverse subjects as echoes and aërial flight dealt with. Reading the volumes with the title of the series in mind, it is satisfactory to find that a proper restraint has been exercised in describing the "wonders;" the narratives of some of the great eruptions and earthquakes of recent times are excellent.

'The Life of Colonel Fred Burnaby.' By Thomas Wright. (London: Everett. 1908. Pp. xxiv., 311, x. *Illustrations.* 12s.) Colonel Burnaby's remarkable career is here set forth authoritatively, for Mr. Wright has had full assistance from many who were most intimately associated with his subject. The account of a life which included travels in Spain, Morocco, Tunis, Russia, Italy, Asia Minor, much aëronautical work and political work, participation in the battles of El Teb, and finally a fall facing the enemy at Abou Klea, needs no recommendation on the score of interest. The book must appeal to a wide circle.

THE MONTHLY RECORD.

THE SOCIETY.

The Awards for 1909.—The gold medals and other awards of the Society have this year been bestowed as follows: The Founder's Medal has been awarded to Dr. M. A. Stein, for his extensive explorations

in Central Asia, in the course of which, besides accomplishing a vast amount of archæological work, he has made important observations on the physical geography, and on the changes which have taken place in the hydrography and other physical conditions of the regions traversed. The Patron's Medal is given to Colonel the Hon. M. G. Talbot, for the large amount of excellent survey-work done by him both on the Afghan frontier and in the Sudan. The Victoria Research Medal goes to Prof. Alexander Agassiz, for the important oceanographical researches accomplished at his own expense during thirty years, during which time he has carried out expeditions throughout most of the oceans of the world, publishing the results in an extensive series of volumes. Of the other annual awards, the Murchison Bequest is given to Captain Rawling, for his explorations in North-Western Tibet and for his expedition with Major Ryder up the upper valley of the Brahmaputra; the Gill Memorial to Commander B. Whitehouse, for his triangulation survey of the whole shores and islands of the Victoria Nyanza, carried out during six years under very considerable difficulties and hardships; the Cuthbert Peek Grant to Captain R. Ommanney, R.E., for his accurate determination of longitudes in Nigeria, by which a trustworthy basis for the map of that territory has for the first time been secured; the Back Bequest to Rai Sahib Lal Singh, for the excellent survey work carried out while attached to Dr. Stein's expedition in Central Asia, as well as in many previous expeditions, from Yemen to Eastern China. After the above awards had been decided on, the news of Lieut. Shackleton's brilliant success in the Antarctic reached this country, and it has been decided to award a special Gold Medal to this explorer in recognition of the valuable results achieved, with replicas in silver to the other members of his expedition.

EUROPE.

The Rainfall of Kent.—In a paper on the 'Water Supply of Kent' (*Mem. Geological Survey*, 1908), Dr. H. R. Mill discusses the rainfall of Kent during the period 1868–1902 in relation to the configuration of the county. The data for these thirty-five years—a period which may be considered as yielding an average very close to the true mean—were collected for the most part by Mr. G. J. Symons, and published from year to year in *British Rainfall*. At thirteen stations the record for the thirty-five years is complete, and from these the long-period averages of a much larger number of somewhat shorter records has been calculated, with the result that 220 separate stations have afforded values for constructing a rainfall map of Kent. The driest year in the county as a whole was 1898, with a deficit from the average amounting to 22 per cent., and the wettest 1872, with an excess over the average of 35 per cent. In a very few cases a correction had to be applied to the records of rain-gauges which had been placed at a considerable height above the ground, in order that they might correspond with the readings taken at the standard height of 1 foot. When the rainfall figures had been placed on a map prepared on the scale of 2 miles to an inch, a reduction of which is appended to the paper in question, isohyetals, or lines of equal rainfall, were drawn at intervals

of 2·5 inches, and by means of a planimeter the areas between these lines were measured. The mean rainfall of each zone could thus be calculated, and the average annual rainfall for the whole county, with an area of 1532·2 square miles, is given as 26·8 inches. The hyetographical, orographical, and geological maps of Kent are remarkably correspondent. The configuration of Kent follows the geological structure so closely that the rainfall may be considered in relation to the former alone. The flat margin along the Thames estuary has a mean annual rainfall under 22·5 inches, and a few square miles have even less than 20 inches. The rainfall increases gradually on the southward slope towards the chalk ridge of the North Downs, the isohyetal line of 25 inches roughly coinciding with the contour-line of 300 feet above sea-level west of the river Medway, with a somewhat lower elevation east of that river. The low rainfall below 25 inches follows the Medway valley through a gap in the North Downs, and penetrates into a small portion of the Weald near Yalding. The low flat land of Romney marsh and its environs also receives less than 25 inches. All parts of Kent more than 500 feet above the sea get more than 30 inches of rain, and these parts are represented by the heights of the North Downs and Greensand ranges running east and west parallel to one another and by the eastern extremity of the Forest ridges. The maximum rainfall in the county (over 35 inches) occurs in a small area near Paddlesworth, on the top of the North Downs, a few miles to the back of Folkestone. This is an exceptionally high rainfall for the south-east of England, and is due not so much to actual elevation as to the particular angle presented by the hill-slopes to the most prevalent rain-bearing winds. The relatively high rainfall over the permeable rocks of chalk and green-sandstone reappears in springs at the foot of the hills, and this circumstance has been favourable to the growth of villages and towns in the narrow longitudinal valley between the two great parallel ridges of Kent. October is the wettest month in Kent, and March, April, May are the driest, on the average of the thirty-five years.

The Ice-sheet of the Vatna Jökull.—Though various travellers have visited this great ice-sheet of South-East Iceland, a good deal remains to be done before its features are completely known, many of the expeditions having been too much hampered by the difficulties of the way to carry out the requisite scientific observations. Dr. H. Spethman, whose journey with the late Prof. von Knebel has already been referred to in the *Journal* (vol. **30**, p. 436; vol. **31**, p. 672), though he did not actually examine the ice-sheet, approached it sufficiently near from the north to gain some idea of its general features, and he has given a useful sketch of our present knowledge regarding it in the *Zeitschrift für Gletscherkunde* (vol. **3**, pp. 36–43). Its general form is that of a gently curved shield, and its central portion forms an almost unbroken mass of ice, above which but a few nunataks rise. The most striking characteristic of the outer parts of the mass is the marked contrast presented by the northern and southern margins. On the latter side it reaches almost to sea-level, while on the former it ends at an elevation of about 800 metres, or (roughly) 2600 feet. The reason of this is the greater distance from the sea on the north, the winds from this direction losing most of their moisture before reaching the ice-sheet. Again, while the southern edge is split up into a number of separate glaciers, on the north it merely forms a succession of slightly projecting lobes, these differences reproducing the differences in the surface forms on the two sides. Dr. Spethman points out that while the southern border may be taken as representing the glacial conditions in the Alpine borderlands during the glacial epoch, the northern edge gives a particularly good idea of what must have been the state of things at the southern margin of the North European ice-sheet. The conditions now prevailing in northern Iceland are also very similar to those which brought

about the formation of loess in the Glacial epoch. We have a broad lava plain fully exposed to the action of the south-west winds, coupled with a general dryness and absence of vegetation. The fine basaltic dust is carried violently into the air, which becomes clear only after rain has fallen. Much of the ice is covered with a layer of fine material. Dr. Spethman urges the importance of a detailed scientific examination of the northern edge of the Vatna Jökull.

Austrian Investigations in the Adriatic.—The association formed in 1903 for the scientific exploration of the Adriatic has taken the first step towards the successful accomplishment of its object by building the research ship *Adria*, which commenced operations for the first time in 1908. Structurally the *Adria* follows the approved model of the Norwegian fishing-smack. With a registered tonnage of 44 tons, the ship has a length of 67 feet, and a greatest breadth of 13 feet; it measures 9 feet in height, and has a draught of 5 feet. The screw is worked by a motor of 75 horse-power. The hull is of wood (oak and pitch-pine), sheathed in copper. The helm, which is particularly easy to work, is placed in the stern. A part of the foreship is laid out for fishing purposes, the fishing apparatus including an electrically worked windlass, a sorting table, and the complete outfit of a marine aquarium. Attached to the ship are two boats each 13 feet long, one of them provided with a benzine motor of 2½ horse-power. The main ship needs a fresh supply of fuel only once every five days, and, running 9 knots an hour, commands accordingly a radius of 450 nautical miles continuous steaming. It has a well-lighted laboratory with oceanographic apparatus, two rooms for microscopic observations, and a dark room for photographic work. A spacious saloon is fitted up as dining and sleeping room, lighted throughout by electricity. In addition to the crew, there is sleeping accommodation for six persons. The merits of the ship lie in its small dimensions, well suited to the conditions of the Adriatic, coupled with seaworthiness, and in its compendious appointments for oceanographical and biological investigation. Apart from the special work of the association, the ship will undertake the service of the Trieste Zoological Station, for which purpose it will at intervals be at the call of the Government, while it is also expected that it will be available for study-trips by students of geography and natural science, an object for which the Adriatic offers a particularly varied field in small compass.

ASIA.

Mr. Carruthers' Expedition in Northern Arabia.—In a letter written from Damascus on March 19, Mr. Carruthers informed us of his return from the expedition to which reference was made in the March number (p. 326). Though it proved impossible to advance beyond Teima, the journey seems to have been of considerable interest, and led through a good deal of new country. Leaving Jesi (between Amman and Kerak, east of the Dead sea) with four riding-camels and three men, the traveller went in an almost straight line to Teima, finding water twice during a journey of seventeen days. At Teima he was well treated by the inhabitants, but the governor, who represented the Emir of Hail, would have nothing to do with him. Between Teima and Hail all the tribes were fighting, so Mr. Carruthers turned north and explored the western edge of the Nefud to within three days of El Jauf. Then, turning west and crossing his former track, he reached the Hejaz railway between Katrane and Jesi. During the journey he kept a detailed route-book, besides making a rough sketch-map and taking many photographs. As a result, the blank on the map between Maan, El Jauf, and Teima can now be covered with names. It is no hostile desert, but offers good grazing in places, while there are several large wadis and wells enough to support a large nomadic population. Game is abundant, including oryx, gazelle, ostriches, and

ibex. One of the most interesting results of the journey was the procuring of five perfect specimens of the Arabian oryx, with many notes as to its habits. Teima has been visited by but few European travellers, none of whom had been there within recent years, while the western borders of the Nefud had previously been virtually unknown ground. Mr. Carruthers purposed doing further natural history work in the region of the Dead sea, but hoped to return to England after three or four months.

Dr. Stein's Expedition in Central Asia.—It is gratifying to know that the Indian Government have lost no time in recognizing the help which Dr. Stein received during his recent expedition from various Chinese officials. His Majesty's Secretary of State for India has been asked to convey the cordial acknowledgments of the Government of India to the officials concerned through the British Minister at Peking and the Chinese Government. As regards Dr. Stein's Chinese secretary, Chiang-su-yieh, the Government of India have decided to present him with a gold watch bearing the following inscription: "Presented by the Government of India to Chiang-su-yieh for valuable service to Dr. M. A. Stein during his tour of exploration in Chinese Turkestan and Western China, 1906–1908."

The Murder of Mr. J. W. Brooke by Lolos.—The fact of the murder of this enterprising traveller in Western China was recorded in the February number (p. 222), though no details were then to hand regarding the precise circumstances of his death. Further information has now been received in this country through Mr. Brooke's companion, Mr. C. H. Mears, who was at Ning-yuan-fu at the time of the sad occurrence, and has since made inquiries in the neighbourhood. It appears that after arriving at Ning-yuan-fu, on December 4, 1908, Mr. Brooke decided to make a preliminary trip to the Lolo country, accompanied only by two interpreters and three coolies. Passing from one Lolo chief to another, and meeting at first with a friendly reception, he met, on December 24, a chief who demanded his rifle, and, on his refusal to part with it, threatened to take it by force. He struck Mr. Brooke three times with his sword, whereupon the traveller, who saw that resistance was useless, retreated with his men. The chief pursuing, the coolies were killed one after another, and Mr. Brooke was eventually forced to draw his revolver in self-defence. The chief and a companion were at once shot dead, but after fifteen of the Lolos had been either killed or wounded, Mr. Brooke was overpowered and bound, whereupon a brother of the chief came up and killed him. Mr. Mears, who had tried without success to recover his body and diary, says that though the Chinese were not directly responsible for the traveller's death, they are responsible for the terrible state of lawlessness existing in the Ning-yuan-fu district. Owing to the feebleness of their hold upon it, the Lolos have lately become bolder than ever, and have robbed and raided close to the city. The half-fed and untrained militia are unable to do anything against them, and the despatch of good troops (which are said to have been sent by thousands into Tibet) into the district is urgently needed.

The Mineral Resources of the Philippine Islands.—An official account of the mineral resources of the Philippines, with map and illustrations, has been issued by Mr. W. D. Smith, chief of the division of geology and mines, as the first of a series of annual publications of that department. The report is summed up in the practical conclusion that a profitable and steady mining industry can be established in the islands. A sub-bituminous coal, resembling black lignite, but every way superior to lignite, is found in nearly every island. The promising coalfields, offering a better quality of coal due to fracturing, consequent dry distillation, and segregation of a greater quantity of fixed carbon, include those of Cebu, Polillo, and Batan islands, the south end of Mindoro island, etc. The structure

of the Philippines, like that of Japan, is profoundly folded and faulted, and this aggravates the difficulty of mining. Hitherto sparingly used as a fuel, and imperfectly available as such, the coal is now undergoing experiment with a view to determining the feasibility of utilizing the gases in gas-producing engines. In all probability the coal could be easily utilized in a producer-plant. Petroleum is found on the east coast of Tayabas and on the west coast of Cebu island. Among other minerals there are hundreds of square miles of limestone, with shell and clay beds, available for cement, the Binangonan quarries turning out about 600 tons yearly; gypsum in Loboo mountains, east of Batangas; guano deposits in nearly every extensive cave; sulphur in Leyte, Mindanao, and Luzon; salt springs, indicating salt deposits; feldspar, fuller's earth, etc. Of metals, gold is an easy first in importance. It is found in most provinces, but chiefly in those of Benguet, Masbate, and Ambos Camarines, in Marinduque island, and in the Suyoc region of S. Lepanto. Copper, though not yet produced in any quantity, is ranked next to gold in importance. A syndicate controlling the Mancayan copper-mines has obtained a concession to build a railway from Mancayan to Bangar, on the west coast of Luzon—a railway of first importance to the general mining industry. Some rich assays of silver ore have been made in the Suyoc mines of S. Lepanto. In the iron industry there are no new developments to record for 1907. The actual mineral production is still insignificant compared with the resources. In 1907 the total production of gold amounted to but 4540 ozs., to which Benguet province contributed 3888; of iron, 436 short tons, all from Bulacan province; of coal, 4545 short tons, from the province of Albany; with a few hundred tons of guano from various caves.

AFRICA.

Pliny's Sources for the Geography of Africa.—The most painstaking attempt yet made to trace in detail the sources drawn upon by Pliny (common also in great measure to Pomponius Mela) for his geographical description of Africa, is that of D. Detlefsen, issued as Heft 14 of Sieglin's *Quellen und Forschungen zur Alten Geschichte und Geographie*. Herr Detlefsen's study of Pliny dates back many years, and probably no living writer has done so much to elucidate the geographical matter, some of his previous contributions having appeared in the same valuable publication. (For a notice of one of them see *Journal*, vol. **25**, p. 673.) The author begins by referring briefly to the work of previous commentators, and urges the need of further detailed study of special subdivisions of the 'Natural History,' in order to obtain an insight into the general question of the sources, the paper now under notice being such a contribution for the African section. In a series of chapters he examines the description of the several African regions in turn, assigning the sources drawn upon for each separate section. The first region dealt with, Mauretania, is of special interest by reason of the short time that had elapsed since it had been incorporated into the Roman empire, much of the information being therefore freshly acquired. Herr Detlefsen's conclusions regarding this part of the subject (p. 26 of his paper) may be referred to, before speaking of his general deductions regarding the sources as a whole. He thinks that both Mela and Pliny had before them, when describing this province, a "paraplus" dating from before 25 B.C., and that while Mela added little to this from his own knowledge, Pliny drew also (in the case of the Atlantic side) upon Polybius and Nepos, the world-map of Agrippa,* and the later reports of Suetonius Paulinus and other contemporary officials; while in the case of the Atlantic and Mediterranean sides alike he made much use of a list of townships—a *formula provinciæ* drawn up in the time

* This map, to which Herr Detlefsen attaches great importance among Pliny's sources, is the subject of a previous memoir by him, forming No. 13 of the same series.

of Vespasian. The descriptions of the other Mediterranean provinces are held to be in part based on a "periplus," the authorship of which Herr Detlefsen is inclined to ascribe to Varro. A *formula provinciæ* seems again to have been used for the province of Africa. As regards the interior of Africa, both Pliny and Mela are held to have drawn upon a single Greek author, possibly a "paradoxographer," whose name, however, cannot be hinted at. For the Ethiopian coasts and islands both authors have utilized certain sources not to be traced in other sections. In summing up the general results of the investigation, the author gives a list of seventeen different authorities from which information would seem to have been derived, apart from that gained by personal experience or inquiry. The exact portions of the text probably derived from each are clearly shown in a table. Pliny's description of Africa thus appears as a mosaic of information from numerous sources. About fifty paragraphs of the text are definitely ascribed to twelve such sources—six Greek and six Roman. For the rest, information was industriously collected from contemporaries and other sources, and praise is due to Pliny for thus utilizing the latest and most trustworthy data available at the time. Of these, the *formulæ provinciarum*, to which the author attributes special importance as a source for the description of all the Roman provinces, are separately dealt with in a supplementary section of the paper. Of the Greek sources, the greater number are held to have been known to Pliny only through Roman intermediaries, while the close resemblances between his work and that of Mela is considered to be due to identity of sources rather than to direct borrowing by the later from the earlier writer. Of the Roman sources, the oldest seems to be the "periplus" attributed to Varro, Agrippa coming next in importance.

Caves in Western Uganda.—While stationed at Kikoma, in the Bwekula county of the Uganda Province (Kingdom of Buganda), Mr. H. B. Lewin has carried out explorations of the numerous caves situated in the western part of the province, a brief description of which he has sent us. The three counties of Bwekula, Bugangadzi, and Bugaya,* within the limits of which (with a small portion of Toro, in the western province) the caves occur, differ from the rest of the Uganda Province, in that a large part of them forms a tableland some 5000 feet above sea, covered with huge boulders of igneous rock, scattered about in disorder, and appearing from an eminence like lines of waves in an angry sea. This country was formerly part of Unyoro, being permanently occupied by the Baganda, with the aid of the British Government, only in 1897. It had long been the hunting-ground of the Baganda, expeditions being sent out twice yearly to plunder, capture, or slay as many of the inhabitants as possible. The Banyoro, on hearing the raiders approach, would flee to the caves, about 125 of which have been located by Mr. Lewin. Some are large enough to hold two or three hundred people, besides cattle and goats. Others have their entrances so low that they can only be entered on the hands and knees. Lions, leopards, wild cats, porcupines, etc., make their homes in the caves, which also harbour deadly snakes and numbers of bats. The entrances are usually situated in a ravine and hidden by thick vegetation, while a stream is often to be found near by or running through the caves themselves. Before taking refuge in any cave a goat or other animal was offered to the spirit supposed to inhabit it. If unable to force an entrance, the invaders lighted fires and endeavoured to suffocate the inmates, large numbers perishing thus from time to time. The accompanying illustration is from a photograph sent by Mr. Lewin to show the nature of the country in which the caves occur. The rocks in which

* *Cf.* the map given in the *Journal* for January, 1902. The area within which the caves occur is in the north of Bwekula and the south of the other two counties.

they are formed seem to be conglomerate, and the hilltops are all crowned with boulders of igneous rocks, piled, in some cases, one above the other. Some have legends attached to them. Thus, not far from Kikoma, there are two known as the Bride and Bridegroom, the legend being that a bridegroom, when bringing home his bride, arrived with her by day instead of in the night, and that on this account the pair were changed by the spirit of the hill into stone. In hollows where soil has collected the native banana-gardens are placed. They give a plentiful return in the rainy season, but become quickly scorched up in the dry months. To the west this tableland falls to the Muzizi river valley, through which an extension of the Uganda railway may in time be made from Lake Victoria to Lake Albert. A preliminary survey has been commenced by Captain Stevenson, R.E. Mr. Lewin's description recalls that of the caves of the Kundelungu plateau in the southern part of the Belgian Congo.

TYPICAL VIEW IN THE CAVE DISTRICT.

Dr. Poch's Expedition in South Africa.—Following on previous reports (*Journal*, vol. **30**, p. 334; **31**, p. 667; **32**, p. 532), intelligence of the progress of this expedition in the summer and autumn of last year has been received at Vienna. The traveller stayed till June 12 at Rietfontein (German South-West Africa), carrying out geographical and geological investigations, while the Bushmen of the neighbourhood were anthropologically examined. In the more important characteristics they are not essentially distinguished from the Bushmen near Oas. An interesting excursion to Sidoni-Asaub, 78 miles west of Rietfontein, gave an insight into the nature of the sand-field of Omaheka. The former name denotes "the well of the Sidon people," these latter forming a branch of the now nearly extinct Khauas-Hottentots. Many kinematograph records of the Bushmen of the neighbourhood in action, most of them following industrial pursuits, were taken. The return journey to Reitfontein gave occasion for the correction of a cartographic error. It was found that the channel of the Epukiro does not, as represented in the maps,

debouch into the Reitfontein river. Thence Dr. Pöch trekked into the Khanseveld, and thence into British territory. From July 10 to September 7 he stayed at the limestone basin Khau, called in Dutch Kamelpan, *i.e.* pan of the Giraffes. Down to the end of last century the pan continued to hold standing water all the year round, enlivened by a rich fauna of elephants, rhinoceroses, giraffes, etc. At present in the dry season water is found only in a deep artificial well. Here again there was an opportunity for technical researches in anthropology, the greatest stress being laid on the reproduction, by the phonograph, of the peculiarly interesting and difficult language of the Kalahari Bushmen. In this locality people of strikingly diminutive stature were not rare. Among seventy grown-up persons nine measured only 135–144 centimetres (4·3 to 4·6 feet). The traveller gathered information respecting manners and customs, as also respecting the conditions prevailing at the time when the Bechuanas, and still earlier the Hottentots, frequented the land. Among his informants was Passarge's former servant, Kostep (Ixóši). The view of the Kalahari in winter is desolate in the extreme; the trees with bare and stunted branches; the soil, sand, relieved by tufts of grass dry as straw; game entirely absent; even insect life in a state of torpidity. On September 11 Pöch reached Tsau, 100 miles further north, having passed on the way two pans with a waterless stretch of 60 miles between them. The whole route lies at a distance from Lake Ngami. A short distance before Tsau he crossed the southernmost arm of the Taukhe, the first running water seen by him since leaving Swakopmund nine months before. The water stood high in consequence of summer rains in the tropical region of the upper Okavango. Even here the volume of water dwindles from year to year, and last year no longer reached Lake Ngami. After the drought of the Kalahari, an excursion into the marshlands of the Okavango made a striking impression from the enormous abundance of animals and the profusion of vegetation. The traveller secured a good collection of the fishes of this district. On October 13 he proceeded eastwards, first to Tofin, on the eastern edge of Ngami, whence the last intelligence of the traveller reached Vienna in the middle of December. Thence Dr. Pöch purposed, on the arrival of the rainy season, to travel to the Botletle river, and thence, crossing the eastern Kalahari, to proceed by way of Seroë, Khama's capital, to Palapye. Lake Ngami was found to be completely dried up, the waters of the Okavango having failed to reach it. Impenetrable growths of reeds line its banks, reminding one strikingly of the Neusiedler lake in Hungary, a little to the south-east of Vienna. A part of the reeds had caught fire, and recalled the Biblical narrative by displaying a pillar of cloud by day and of fire by night.

AMERICA.

Diversion of Water from Niagara and its Effects.—An address by Dr. Spencer to the American Association for the Advancement of Science on the Spoliation of the Falls of Niagara has been reprinted from the *Popular Science Monthly* (October, 1908, pp. 289–305). It contains a brief statement of the author's views as to the history of the falls contained in the monograph reviewed in the *Journal* for October, 1908 (p. 420), and discusses the wide-reaching efforts of the diversion of the water by the power companies. Dr. Spencer admits that a limited amount of power can be taken from the falls without injury to the scenery; but he maintains that if the Canadian and the two New York companies take the water up to the full limits of their franchise the beauty of the falls will be very greatly diminished. The depth on the Canadian side of the Horseshoe fall has been already reduced by 16 inches, and thus the edge of the rock is now exposed in many places, and the fall lessened in width. If the power companies take all the water to which they are legally entitled, the Horseshoe falls will be restricted

to Canadian territory, and the American falls will be reduced to half their present width and broken up into a few strings of water. Moreover, the diversion of water from above the upper rapids has lowered the water-level there and increased the river gradient, and consequently the velocity of the current. Dr. Spencer estimates that an increased discharge of 22,000 feet per second at Niagara lowers the level of Lake Erie by a foot; so that, while the increasing size of the lake steamers calls for deeper harbours and canals, their depth is being reduced. According to Dr. Spencer, the operations of the power companies at Niagara may, by the diminished carrying power and freight receipts by the lake steamers, the increased cost of harbour works and other indirect consequences, cost the two countries concerned 25 million dollars a year. The change has not yet been felt, owing to the present abnormally high level of the lakes in 1908. They were then higher than in any year since 1838. The levels were unusually low in 1819. These dates for high and low levels are in interesting agreement with Brückner's thirty-five years period.

Georgian Bay Ship Canal.—A blue-book issued by the Department of Public Works, Canada, gives a detailed account of a proposed canal, to be at least 22 feet deep, for the passage of large boats (600 feet × 60 feet × 20 feet draft) from Lake Huron to Montreal. Happily, there are natural channels utilizable to the extent of 80 per cent. of the whole distance of 440 miles from Georgian bay to the St. Lawrence. From Fort William as starting-point, the distance to Montreal by the proposed waterway is 934 miles as against 1216 miles *viâ* Lake Erie and the Welland canal, and 1358 miles *viâ* Buffalo and Erie canal to New York. From Fort William, again, to Liverpool is by the proposed canal 4123 miles, as against 4529 miles *viâ* New York. Leaving out of account the immense superiority of the proposed route's carrying capacity, it is calculated, in respect of time, that, allowing three-quarters of an hour's delay at each lock, the whole passage from Georgian bay to Montreal would be cleared in about seventy-three hours, involving a gain of from one to one and a half days as compared with any other existing water-route from the head of the lakes to an ocean port. From Georgian bay the canal follows the French and Pickerel rivers to Cantin island; thence through the French river to Chauvière falls. Next, crossing Lake Nipissing to North bay, it thence proceeds through Trout, Turt'e, and Talon lakes to Sand bay. Thence there is a canal for 3 miles to the Mattawa river, which is utilized as far as the town of Mattawa, a distance of 13 miles. Here another canal, $\frac{3}{4}$ of a mile in length, gives entrance into the Ottawa river. This river, expanding in many places into large and deep lakes, is followed for 293 miles to the foot of Oka lake—a route illustrated by twelve consecutive plans. From Ste Anne, on Oka lake, to Montreal, a distance of 25 miles, there is the option of passage either by the St. Lawrence or by the Rivière des Prairies. The Report includes various technical calculations.

Man and Climatic Change in South America: Errata.—The following corrections should be made in the paper on this subject in the March number: P. 272, third line, fifth word should be "Iquique;" p. 272, fifth line from the bottom, third word should be "the;" p. 272, second line from the bottom, fifth word should be "Lipez;" p. 277, sixth line from the bottom, comma after "invoked;" pp. 275 and 277, the two half-tone illustrations are interchanged: both *title* and *description* of the one belong to the other, as may be seen by trying to identify the points mentioned in the description.

AUSTRALASIA AND PACIFIC ISLANDS.

The Vegetation of Mount Hector, New Zealand.—The Tararua range of mountains to which Mount Hector belongs, though not far from Wellington, has hitherto been little explored from a botanical point of view, but a recent paper

by Mr. D. Petrie in the *Transactions and Proceedings of the New Zealand Institute* (vol. 40), affords interesting information upon the subject, and gives a full list of the flowering plants observed on the range by a recent small party of explorers. The whole range is, geologically speaking, of recent elevation, and the existence of the Manawatu gorge which crosses it at its northern extremity shows that the elevation was gradual, the mountain axis being raised with sufficient slowness to keep pace with the deepening of the valley of the Manawatu river. Mount Hector, 5106 feet above sea-level, lies towards the southern and wider extremity of the range, and is the culminating point of an extensive elevated plateau. The slopes of the mountains are covered with forests, but at the lower levels much clearing has taken place, with conversion of the land into pasture. Above the forest-level and its limiting zone of sub-alpine scrub it is still virgin country, and as this condition is likely to exist for a few years more, a thorough examination of the upland tract will probably be made. The forests of the lower levels consist essentially of *tawa*, but on the higher parts two species of beech (*Fagus fusca* and *Fagus menzierii*) constitute the predominant trees. Above the sub-alpine scrub of tangled undergrowth one enters the alpine grass or meadow region, and here many fine flowering plants prevail, amongst which the strong-scented *Olearia lacunosa* is conspicuous. When the main plateau region around Mount Hector is reached, only grasses and diverse low forms of plant-life are found—the cold wet ground and the winter snow-covering being unfavourable to the luxuriant growth of vegetation. One of the most interesting phenomena referred to by the author of the paper is the leaf-variation of *Drimys axillaris* at different elevations of the Tararua ridge. With increasing altitude the leaves become progressively longer, narrower, and more acute, whilst their colour also changes. These facts are ascribed to stronger insolation at the higher levels, and to lower and less crowded competing vegetation. The views from the high tops of the Tararua are described as grand and extensive. "The western plains as far as snow-capped Egmont and Ruapehu, the distant ghostly lines of the Kaikowras and the higher ranges of southern and western Nelson, the whole neighbourhood of Cook strait, and the plains and hilly country away to the eastern ocean, all lie spread out, as it were, at your feet."

POLAR REGIONS.

New Danish Expedition to East Greenland.—Mr. Einar Mikkelsen has succeeded in obtaining influential support for a new expedition, the main object of which is the recovery of the records supposed to have been left in the neighbourhood of Denmark fjord by the lamented Mylius Erichsen, when he and his two companions started on their last hopeless struggle to return to their ship. Mr. Mikkelsen writes giving some details as to his proposed plans for the voyage. He will sail in a small vessel of about forty-five registered tons net, with a crew of six besides himself. The vessel, which is of the same type as the *Gjöa*, will be fitted with a motor capable of propelling her at a rate of 4 miles per hour. Reaching the Javoe islands about July 5, Mr. Mikkelsen will there meet a steamer from Greenland with fifty dogs, and will steer north, entering the ice off the east coast of Greenland in about 74° to 75° N. He will endeavour to strike the coast somewhere about Cape Bismarck, and, after laying a depôt as far north as possible, go into winter quarters near that cape. Trips will be made, and depôts laid out, during the winter, and on the advent of spring all will start north, and push forward the depôts as far as Lambert Land, whence the leader and two men will push on over the ice-sheet to the head of Denmark fjord. If, as he hopes, he finds the depôt left by Erichsen at Cape Rigsdagen, at the north end of the fjord, he will try to push westward up Peary channel, and discover whether it is a sound or an arm

of an extensive fjord system. Then when the state of his supplies compels him, he will return to Cape Rigsdagen and thence to the ship. Meanwhile the rest of his men will have prosecuted researches about the winter quarters. When the ice permits, Mr. Mikkelsen will try to reach the bank found by the Duke of Orleans, and prove by soundings what is its precise character, after which he will push out of the ice and return home. Such is the general nature of his programme, though the precise manner of its execution must, of course, depend on circumstances.

Dr. Charcot's Antarctic Expedition.—According to letters received in Paris during April, the *Pourquoi pas ?*, with Dr. Charcot's expedition on board, left Punta Arenas on December 16, making its way to the South Shetland group, and stopping to take in coal and make observations at Deception island, which has become an important rendezvous of whalers. The voyage towards Alexander Land, where Dr. Charcot hopes to establish winter quarters, was to be resumed on December 25.

GENERAL.

Similarities and Contrasts between Europe and North America.—In a temporary interchange of professors lately arranged between certain American and German Universities, it fell to Prof. Penck, of Berlin, to deliver a course of lectures at Columbia University, New York. For the inaugural lecture of the series, of which a report appears in *Science* for February 26 of this year, Prof. Penck chose as his subject a geographical comparison between Europe and North America. The subject has often been approached before, but the masterly way in which the broad features of the comparison are outlined by Prof. Penck renders the lecture worthy of special attention. The superficial similarities between the two continents in the matter of form are more or less obvious, the character of Europe as a westward-stretching peninsula of Eurasia being reproduced by the eastward-stretching, more or less peninsular portion of North America; while the White sea and Hudson bay, the Baltic and the Gulf of St. Lawrence (with the associated great lakes), the Mediterranean and the Gulf of Mexico are other pairs of similar features, due to a similar articulation of the coasts facing the Atlantic. But the two sides of this ocean repeat also the same structural features. In the north-east of Canada and Labrador, as in Scandinavia and Finland, there is a "shield" of the oldest known rocks, moulded by glaciation in a similar way, and equally characterized by the great abundance of lakes; while the horizontal palæozoic strata at the southern border of each begin with a well-developed escarpment. Further south, we come in each case to a region never compressed by folding since Palæozoic time, with similar morainic and loess formations on the surface. East of the Mississippi basin, and west of the plain of Russia, there is a series of mountains (the Alleghanies and "Hercynian" chains respectively) folded near the end of the Palæozoic era. On both sides of the Atlantic, the belt formed by their ancient foothills contains coal-measures, while the way in which either mountainous zone runs out towards the Atlantic has suggested the idea that the belt was once continuous across that ocean. Similar structural features between the Mediterranean region and that of the Gulf of Mexico are also traceable, though the absence from the latter of a high belt of mountains to the north has important consequences. Thus the Alps form a marked climatic barrier between the regions on either side—a barrier which does not exist in the case of America. For other reasons the climate on the two sides of the Atlantic (though "peninsular" in both cases) is not the same, for there must be differences between the east and west sides of a continent. Europe has the true climate of a west continental coast, which is matched, in America, in British Columbia. Again, the semi-arid Mediterranean climate is matched in California. It is to its climatic character, with the need of irrigation associated therewith, that

the Mediterranean region owes the early development of its civilization. But though a certain civilization arose in the American counterpart of this region, it was feeble by comparison, and could not extend in the same way, for the forest-clad shores of the Gulf of Mexico could never see the growth of an empire like that of Rome. Further north, the influence which has been most potent in European history has been the peaceful expansion of the German forest-folk, favoured by the central position of Germany, but due also to the fact that Germany herself is a country not too favoured by nature. Prof. Penck draws a parallel between this German expansion and that of the people of eastern North America over the entire continent. Finally he refers to a fact not very generally known, in pointing out that not only did America obtain its name through a German professor (Waldseemüller), but that "Amerigo," whence it was derived, is in reality a German family-name, "Emmerich" (Emery in English). This may, perhaps, be translated "rich in corn"; so that, if incorrect, the name would in this case be certainly appropriate.

Captain Lyons' Successor as Director of the Egyptian Surveys.—We are informed that Mr. E. M. Dowson, F.R.G.S., A.M.I.C.E., has been selected to succeed Captain Lyons as Director-General of the Survey Department of Egypt on the latter's retirement in June next. Mr. Dowson has for some years been in charge of the Topographical Section of the Department.

Von Löwl's Successor at Czernowitz University. — Dr. August von Böhm, hitherto of the Vienna Polytechnic, has been called as ordinary professor to the Geographical Chair at the university of Czernowitz, in succession to Ferdinand Von Löwl, whose untimely and lamented death in the Alps was recorded in the *Journal* for August last (vol. **32**, p. 192). August von Böhm was born in 1858 in Vienna, his father being Prof. Karl v. Böhm. His first important work was his 'Einteilung der Ostalpen' (1887), in which he departed from the purely geological division adopted by other writers, evolving a system which has since held its own, even for touristic purposes. A disciple of Simony's, his teacher's influence may be traced in his intensive topographical study of a single mountain group put forward in his 'Führer durch die Hochschwabgruppe.' From 1885 onwards he has devoted considerable attention to glacial investigations on modern lines, the fruit of which has been such memoirs as 'Die alten Gletscher der Enns und Steya,' 'Die alten Gletscher der Mur und Mürz,' and his larger work, partly historical, partly critical in character, entitled 'Geschichte der Moränenkunde' (Abh. d. Geogr. Ges. Wien, 1901, iii. Bd.). Other critical studies are his contributions to the biography of Friedrich Simony. Besides filling the chair at the Vienna Polytechnic, Prof. v. Böhm has, from 1889 to last year, edited the publications of the Vienna Geographical Society.

OBITUARY.

Dr. E. T. Hamy.

The death of this well-known French ethnologist took place at the end of 1908. Dr. Hamy was born at Boulogne in 1842, and received a medical training at Paris. On this basis he began a long and laborious scientific career, in the course of which he closely studied the development of the various branches of the human race. His first work of importance, on 'The Intermaxillary Bone of Man in its Normal and Pathological Condition,' was crowned by the French Academy. In 1867 he was appointed secretary of the Society of Anthropology, of which he was president in 1884 and 1906. As a lecturer, he dealt especially with the comparative anatomy of the human races, including in his studies Tertiary Man in America and

the theory of Multiple Centres of Creation. He took part in the inauguration of the Suez Canal in 1869, and, after a visit to the Nile, published a memorandum on the Negroes of the Nile valley. Perhaps his most important work was 'Crania Ethnica' (1882), published in one volume with one hundred maps, in collaboration with his colleague, M. Quatrefages.

During the war of 1870 he acted as a surgeon with the French army, and in the same year issued his 'Human Palæontology,' which was based on his own investigations, and cleared up the ethnography of the primitive peoples of northern France. In 1891 he undertook with striking success the reorganization of the Natural History Museum, and in the next year succeeded his friend M. Quatrefages in the chair of Anthropology. Prior to this date and after 1880 he had been occupied in organizing the Ethnographical Museum, which was housed in the old palace of the Trocadero. He took part in a scientific expedition to Tunisia in 1887, and embodied his researches in a paper, "The Country of the Troglodytes." In 1890 he was elected a member of the French Academy, and commenced a series of publications on the work of French travellers. He also carried out various studies in the history of geography and cartography, the results of which were eventually collected in a volume entitled 'Etudes Historiques et Géographiques' (1896). At the fourth centenary of Columbus he took part in the celebrations at Cadiz and Genoa, and became president of the Americanist Society which was founded at the time. All the while Dr. Hamy continued to be deeply interested in his native town, where he lectured and was prominently engaged in the celebration of local worthies. He was twice president of the Société de Géographie. M. Henri Cordier, his colleague and friend, who contributes an obituary notice to the January number of *La Géographie*, considers his studies of ancient Mexico and Peru to be his most enduring work. He deplores with the leading scientists of France "one whose memory will recall encouragement to young men, sympathy with hard workers, and deep affection for his friends."

Gabriel Marcel.

Another French savant, long recognized as one of the foremost authorities on subjects connected with the history of cartography, has passed away in the person of Gabriel Marcel, whose death occurred on January 26 of this year, only a few weeks after that of Dr. Hamy. An appreciative obituary notice has been given by Prof. L. Gallois in the March number of the *Annales de Géographie*, with the management of which paper M. Marcel was officially connected. His death occurred suddenly, and only the day previously he had been at his post in the National Library, with which his whole official career had been connected. Entering its service while quite a young man, he had in time risen to be head of the section of maps and plans, a post for which his geographical tastes had already marked him as specially suited. This was in 1881, since which time his persistent efforts had been directed to the improvement of the collection, so far as the means at his disposal permitted, and its more suitable housing. Not the least of his services was the part which he took in making known the cartographical treasures under his charge, both by his writings and by the exhibitions organized on such occasions as the celebration of the fourth centenary of the discovery of America, while his wide knowledge was placed freely at the disposal of students who visited the collection. Those at a distance were likewise under an obligation to him for his services in rendering early maps accessible by the publication of photographic facsimiles. Two important collections of these were brought out under his auspices, viz. the 'Reproductions de cartes et de globes relatifs à la découverte de l'Amérique'

(1893), and the 'Choix de cartes et de Mappemondes des XIV^e^ et XV^e^ siècles' (1896). Many memoirs from his pen appeared in the publications of learned societies and elsewhere, one of his latest studies being that on the Spanish cartographer Lopez, to which reference was made in the *Journal* for September, 1908. He had served on the Central Commission of the Paris Geographical Society, over which he presided in 1899, as well as in the geographical section of the "Comité de des Travaux historiques et scientifiques," of which he had only recently been made a vice-president.

Prof. J. M. Pernter.

We regret to record the death, on December 20 last, of Prof. Joseph Maria Pernter, Director of the Vienna Central Institute for Meteorology and Geodynamics, which took place at Arco, South Tirol. A peasant's son, born in 1848 at Neumarkt in the Tirol, he studied at the universities of Innsbruck and Vienna. Graduating at the latter university, he became, first assistant, then adjutant (1880–1884) at the Meteorological Central Institute. Having qualified as lecturer in cosmical physics, he taught from 1890 to 1897 at the Innsbruck university—after 1893 as ordinary professor. On Hann's resignation of office, Pernter was, in 1897, appointed director of the Central Institute, lecturing at the same time at the university on geophysics. Enlarging the functions of the Institute, he took over the chief direction of seismic observations previously carried out by the Academy of Sciences. Among his more valued works may be mentioned his German edition of R. Abercromby's 'Weather,' his contributions on wind-conditions in the upper air and on optical phenomena in the atmosphere. His optical studies culminated in his chief work, 'Meteorologische Optik,' the conclusion of which, however, was not his own work, but handed over by him to Dr. F. Exner, secretary of the Central Institute. The provisional direction of the Institute has been entrusted to Dr. Wilhelm Trabert, Professor of Cosmical Physics and head of the Innsbruck Meteorological Observatory.

Hastings Charles Dent.

Mr. H. C. Dent, whose death at the comparatively early age of fifty-three took place at his residence at South Godstone in March of this year, had been a Fellow of our Society since 1885. A civil engineer by profession, Mr. Dent had travelled abroad extensively, and had in particular done a good deal of surveying in connection with railway construction in Brazil. Some of his experiences in that country were described in his work, 'A Year in Brazil' (1886). He was a man of varied interests, and was a member of the Linnean and Zoological Societies, as well as of the R.G.S. He had brought together a valuable collection of butterflies, moths, and beetles, as well as of curios and works of art met with on his travels. He settled at Godstone some twelve years ago, passing some of his time, however, at his town house in Eccleston Square.

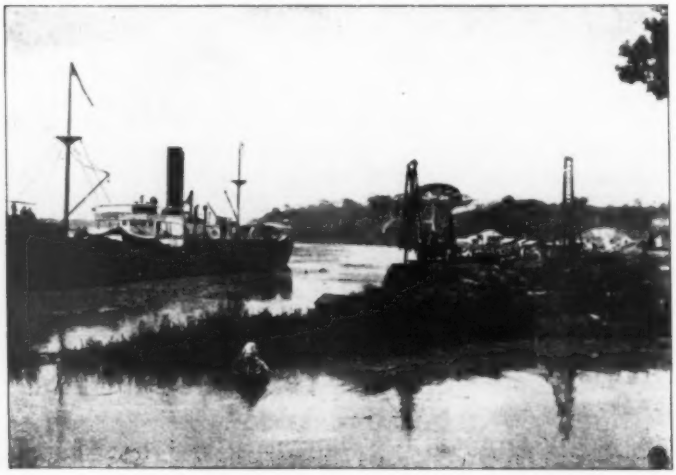
CORRESPONDENCE.

Navigability of the River Amazon.

It was in January, 1853, that the *Companhia do Amazonas* inaugurated its steamer service on the river Amazon, under a contract made with the Imperial Government the preceding year. At that time the trade between Pará and the

now important city of Manaos, near the mouth of the Rio Negro, 1000 miles from the sea, was carried on by canoes, which rarely realized the voyage in less than five months. Now, European steamships of heavy draft of water do a regular trade with that flourishing emporium, and river steamers connect Manaos with Iquitos, the Amazon port of Perú, 2300 miles from Pará; and vessels drawing 14 feet of water can ascend to Achual point, 486 miles above Iquitos.

But mere figures do not bring home to the human mind the navigability of the great inland sea, which Pinzon named the *Mar Dulce*, so well as an object-lesson, and therefore I give you the following picture which I have just received from Mr. Ashmead, the chief engineer of the Madeira and Mamoré railway, now under construction, to avoid the falls of the Madeira. The lower fall is 1533 stat. miles above Pará. The picture represents the British steamship *England* being docked



BRITISH S.S. "ENGLAND" (7000 TONS) COMING ALONGSIDE TEMPORARY DOCK AT PORTO VELHO.

at the northern terminus of the railway at San Antonio on January 23 last. She is about 7000 tons cargo capacity, and, among other material, has 4000 of rails and 1000 tons of coal for the railway.

The railway works are being pressed forward with fair speed and regularity. Some 1300 men are employed on them, and their health is fairly good. At the present rate of progress, there should be no difficulty in completing the line within the next two years. The effect of this on all the countries drained by the navigable affluents of the Amazon promises to be of primary economic importance to the great valley—in fact, the key-note to a vast commercial development.

G. E. CHURCH.

Health on the Isthmus of Panama.

In the lecture which I had the honour to deliver last November before the Society I described the health conditions upon the Isthmus of Panama as I found them in 1908, but in my paper, published in the February number of the *Journal*, I was necessarily restricted to health statistics for 1907. Colonel Gorgas' report for the year 1908, since issued, shows how great was the improvement of health in 1908 over that in 1907 (which was in its turn much healthier than 1906). I extract the following figures:—

EMPLOYEES OF THE CANAL COMMISSION.

Year	Force	Deaths	Rate per thousand
1907	39,343	1133	28·77
1908	43,899	571	13·01

Total population of the Canal Zone, together with cities of Panama and Colon—

Year	Population	Deaths	Rate per thousand
1907	102,133	3435	33·63
1908	120,097	2983	24·83

The death rate from disease during 1908, among white American men employed by the Commission, was 3·84 per thousand. The progressive diminution of cases of malaria is also interesting. Thus out of every 1000 employees there were the following admissions to hospital on account of this disease:—

1906	821
1907	424
1908	282

VAUGHAN CORNISH, D.SC.

31, Kensington Gardens Square, W.,
April 7.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1908-1909.

Twelfth Meeting, March 22, 1909.—Major LEONARD DARWIN, President, in the Chair.

ELECTIONS.—*Major Dudley Alexander, C.M.G.; James Batty; Siegmund Behr; Jas. Charles Cook; Julian Grande; Philip Johnson; Fredk. Augustus Cortes Leigh; Thomas Parkin; James Edward Pearce; Archibald March Pitkin; Alfred Rowe; Charles G. Skyrme; Lieut. Gregory Stapleton, R.N.; Fredk. Claude Stern; Alfred Harry Wallis.*

The paper read was:—

"The Colorado Canyon: Some of its Lessons." By Prof. W. M. Davis.

Thirteenth Meeting, April 5, 1909.—Major LEONARD DARWIN, President, in the Chair.

ELECTIONS.—*Harry Harford Willoughby Brice; Stephen Troyle Dunn; Egidio Ferrari; Captain F. Fraser Hunter, I.A.; Charles Kelsall Johnson; W. J. Maitland, C.I.E.: Olaf A. Malmberg; R. C. Mules; Joseph Seel; Frederick Temple; H. F. Varian.*

HONORARY CORRESPONDING MEMBER.

Père E. Colin (Madagascar).

The paper read was:—

"The Scenery of Cuba, Haiti, and Jamaica." By Sir Harry Johnston, G.C.M.G., K.C.B.

THE ANNUAL AWARDS.

The PRESIDENT: It is customary at this meeting to announce the names of those to whom the Royal Medals and other Awards have been given—that is, at the first meeting after the approval of His Majesty to the Royal Medals has been received. As you all know, the medals themselves are presented at the Annual Meeting on May 24, and on that occasion it will be my pleasant duty to dwell at some little length on the distinguished services of the recipients. To-night, therefore, I will content myself with doing little more than giving you a list of their names. The Founder's Medal has been awarded to Dr. Stein, the brilliant account of whose archæological and geographical discoveries in Chinese Turkestan may, I think, be said still to be ringing in our ears. The Patron's Medal has been awarded to Colonel the Hon. M. G. Talbot, of the Royal Engineers, who has done an immense amount of survey work in India, in the North-West Provinces, and in Egypt, in circumstances of rather exceptional difficulty. He is one of our greatest living authorities on questions connected with the geography of Afghanistan. It is specially pleasant to be able to personally congratulate him to-night, as I am sure you will all join me in doing. The next medal I have to mention is the Victoria Research Medal, which is not given every year, and is only given for scientific work of exceptional merit. This year it has been awarded to Prof. Alexander Agassiz, of Harvard University, who by thirty years' admirable scientific work has won for himself a wide-world renown as an oceanographer, well and justly. The Murchison Award has been given to Captain Rawlinson, whose work on the north-west frontier of India, in North-Western Egypt, and on the Brahmaputra is so well known. The Gill Memorial has been given to Commander Whitehouse, who surveyed practically the whole of the Victoria Nyanza Lake. The Cuthbert Peek Grant has been given to Captain Ommanney, who, amongst other services, determined the longitude of a great number of towns in Northern Nigeria. The Back Grant has been given to Rai Sahib Lal Singh, the admirable and faithful native surveyor who accompanied Dr. Stein in his last journeys.

As you may imagine, the awarding of these medals requires a good deal of attention, and it is some little time since the Council took these matters into consideration. Since these awards were actually decided on, a geographical event of a very startling nature has occurred. I allude, of course, to the report of Lieut. Shackleton's wonderful achievements near the South Pole. The Council of your Society have to-day decided that this is a matter of such exceptional interest that it must be treated in an exceptional way, and they have determined, following the example set in the case of Captain Scott and the National Antarctic Expedition, to award to Lieut. Shackleton a Special Gold Medal, and to those who served with him, silver replicas. We must remember that Lieut. Shackleton took every possible advantage of the experience gained in his former expedition, and as a result of that experience and of his admirable organizing power, he has reached a spot nearer to the pole than any other traveller has ever reached before, either in the Arctic or Antarctic Regions. We must also remember that parties from his expedition have climbed Mount Erebus, and have also for the first time visited the southern magnetic pole. When all these facts are remembered, and, more important than all, the admirable scientific work connected with the expedition, I am sure that the Society and this meeting will endorse the action of the Council in awarding a special medal to Lieut. Shackleton and his followers.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Glaciation. **Penck and Brückner.**

Die Alpen im Eiszeitalter. Von Albrecht Penck und Eduard Brückner. 3 vols. Leipzig: Chr. Herm. Tauchnitz, [1901–]1909. Size 10½ × 7, pp. (vol. i.) xvi. and 1-394; (vol. ii.) x. and 395-716; (vol. iii.) xii. and 717-1200. *Maps, Illustrations, and Sections. Price* 55*m. Presented by the Publisher.*

Alps—Glaciers. *B.S. Neuchateloise G.* **19** (1908): 96-119. **Girardin.**

La glaciation quaternaire et actuelle en fonction du socle dans la "Savoie Massive." Par Paul Girardin. *Illustrations.*

Austria—Climate. **Mazelle.**

Klimatographie von Österreich. Herausgegeben von der K. K. Zentralanstalt für Meteorologie, u.s.w. II. Klimatographie des österreichischen Küstenlandes. A.—Triest. Von Edward Mazelle. Vienna, 1908. Size 11 × 7½, pp. 72.

Part i., by Dr. J. Hann, appeared in 1904.

Austria—Karst. *Z. Ges. E. Berlin* (1908): 468-480. **Grund.**

Die Oberflächenformen des Dinarischen Gebirges. Von Prof. Dr. Alfred Grund. *Illustrations.*

Austria—Styria. *M. k.k. G. Ges. Wien* **51** (1908): 310-322. **Götzinger.**

Morphologische Bemerkungen zur Dammrutschung bei Ardning (Oberennstal) im Februar 1908. Von Dr. Gustav Götzinger. *Sketch-maps, Illustrations, and Section.*

Traces the causes of the collapse of a railway embankment to the geological and hydrographical features of the locality.

Balkan Peninsula. **Henderson.**

A British Officer in the Balkans. The account of a journey through Dalmatia, Montenegro, Turkey in Austria, Magyarland, Bosnia, and Hercegovina. By Major Percy E. Henderson ("Selim"). London: Seeley & Co., 1909. Size 9 × 5½, pp. 302. *Map and Illustrations. Price* 16*s. net. Presented by the Publishers.*

Denmark—Signal Stations.

Fortegnelse over fyr og taagesignalstationer i Kongeriget Danmark med bilande,

1909. Udgivet af det K. Danske Søkort-Arkiv. Kopenhagen, 1909. Size 10 × 6½, pp. 130.

Færoes.

Botany of the Faeröes, based upon Danish investigations. Part iii. Copenhagen, etc.; Glydendalske Boghandel, 1908. Size 10 × 7, pp. 683–1070 and xxviii. *Maps and Illustrations. Presented by Prof. Dr. Eug. Warming.*

Parts i. and ii. of this important work were noticed in vol. **24**, p. 468, and the section of part iii. dealing with the land vegetation in vol. **32**, p. 303. Other sections, by different authors, treat of various special subjects, one being the insect fauna.

France—Ariège. *Spelunca* **7** (1908): No. 53, pp. 24. **Molard and Martel.**

Les grottes de Sabart: Niaux et les dessins préhistoriques. Par le Commdt. Molard et E.-A. Martel. *Plans and Illustrations.*

France—Corsica. *C.R.A. Sc. Paris* **147** (1908): 1442–1445. **Castelnau.**

Sur les traces d'un mouvement positif le long des côtes occidentales de Corse et son rôle dans la morphologie et l'évolution du littoral. Note de Paul Castelnau.

France—Hérault. *B.I. Océanogr., Monaco*, No. 130 (1908): pp. 8. **Sudry.**

Sur un genre particulier de fond marin dans l'étang de Thau. Par L. Sudry.

France—Western. **Sion.**

Jules Sion. Les paysans de la Normandie orientale: Pays de Caux, Bray, Vexin Normand, Vallée de la Seine. Étude géographique. **Paris**: Librarie A. Colin, 1909. Size 10 × 6½, pp. viii. and 544. *Maps and Illustrations. Price* 12 *fr. Presented by the Publishers.*

Germany—Bavaria—Lakes. **Edelmann.**

Die Oberbayerischen Seen. Von August Edelmann. Munich: M. Kellerer, 1906. Size 8½ × 5½, pp. viii. and 266. *Map and Illustrations. Price* 4*s.*

A systematic description of the lakes under various aspects.

Germany—Forests. *Naturw. Wochenschrift* **23** (1908): 593–604. **Eckhardt.**

Die Wälder der Heimat. Eine allgemein naturwissenschaftliche Charakteristik einiger ihrer Haupteigentümlichkeiten. Von Dr. Wilh. R. Eckhardt.

Discusses, *inter alia*, the influence of forests on climate.

Germany—Gravity Observations. **Galle.**

Veröffentlichung K. Preuss. Geodät. I., N.F. **36** (1908): pp. xii. and 200.

Lotabweichungen im Harz und in seiner weiteren Umgebung. Von Prof. D. A. Galle. *Maps.*

Germany—Mecklenburg. **Geinitz.**

Ergebnisse der Brunnenbohrungen in Mecklenburg. Von Dr. E. Geinitz. (*Mitteilungen aus der Grossherzogl. Mecklenburg. Geologischen Landesanstalt*, 20.) Rostock, 1908. Size 11½ × 9, pp. 44. *Diagrams. Presented by the Author.*

Germany—Relief. *Sitzb. Naturhist. V. preuss. Rheinlande* (1907): D., 24–40. **Lorenz.**

Ueber den Gebirgsbau Mitteldeutschlands. Von Th. Lorenz. *Sketch-maps and Sections.*

Germany—Rhine Basin. **Stürtz.**

Verh. Naturhist. V. preuss. Rheinlande **64** (1907): 1–96.

Das Rheindiluvium talwärts von Bingerbrück. Eine Skizze von B. Stürtz. *Sketch-map.*

Iceland. **Komorowicz.**

Quer durch Island. Reiseschilderungen von Maurice von Komorowicz. Charlottenburg (Berlin): Schiller-Buchhandlung, [1908]. Size 8½ × 5½, pp. 140. *Sketch-map and Illustrations. Price* 2*m.*

Account of a journey across Iceland in 1908.

Iceland. *Z. Ges. E. Berlin* (1908): 451–467. **Pjetures.**

Einige Hauptzüge der Geologie und Morphologie Islands. Von Dr. Helgi Pjetures. *Map and Illustrations.*

Italy. **Various Authors.**

Scritti di geografia e di storia della geografia concernenti l'Italia, pubblicati in onore di Giuseppe dalla Vedova. Florence, 1908. Size 9½ × 7, pp. xxxii. and 402. *Maps, Plans, and Illustrations. Presented by the Società Geografica Italiana.*

The more important papers in this volume are separately entered.

Italy—Calabria. *Scritti G. e Storia G. concernenti l'Italia* (1908): 197–232. **Grasso.**

Questioni topografiche e topologiche sull' estrema Calabria: anche in difesa di "La Catona." Di Gabriele Grasso. *Sketch-maps.*

Deals with the early topography and history of the extremity of Italy, with special reference to Catona, mentioned by Dante (according to some manuscripts) in the 'Divina Comedia.'

Italy—Historical. *Scritti G. e Storia G. concernenti l'Italia* (1908): 179–196. **Gribaudi.**

Una descrizione inedita dell' Italia di Riccobaldo da Ferrara. Di Pietro Gribaudi.

Italy—Piedmont. *Scritti G. e Storia G. concernenti l'Italia* (1908): 31–52. **Marinelli.**

Osservazioni morfologiche nell' alta Ossola. Di Olinto Marinelli. *Illustrations.*

Italy—Pisa. **Ross and Erichsen.**

The Story of Pisa. By Janet Ross and Nelly Erichsen. ('The Mediæval Towns Series.') London: J. M. Dent & Co., 1909. Size 7 × 4½, pp. xii. and 418. *Plans and Illustrations. Price 4s. 6d. net. Presented by the Publishers.*

Italy—Sardinia. *Scritti G. e Storia G. concernenti l'Italia* (1908): 20–29. **Palazzo.**

Sul rilevamento magnetico della Sardegna. Di Luigi Palazzo. *Map.*

Norway. **Monroe.**

In Viking land. Norway: its peoples, its fjords, and its fjelds. By W. S. Monroe. London: G. Bell & Sons, 1908. Size 8 × 5½, pp. xxiv. and 332. *Map and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

Spain—Meteorology. ——

Resumen de las observaciones meteorológicas efectuadas en la peninsula y algunas de sus islas adyacentes durante el año 1907, ordenado y publicado por el Instituto Central Meteorologico. II. Madrid, 1908. Size 8½ × 6, pp. viii. and 172. *Sketch-map.*

United Kingdom—England. **Harrison and Furnivall.**

Harrison's Description of England in Shakespeare's youth. Being the second and third books of his Description of Britaine and England. Edited from the first two editions of Holinshed's Chronicle, A.D. 1577, 1587, by Frederick J. Furnivall, with additions by Mrs. C. C. Stopes. Part IV.—The Supplement, § 2. London: Chatto & Windus, 1908. Size 10 × 7, pp. 197–428. *Price 17s. 6d. net. Presented by the Publishers.*

This completes the work begun under Prof. Furnivall's editorship in 1877. It consists of notes and extracts elucidating the original description.

United Kingdom—England. **Leland and Smith.**

The Itinerary of John Leland in or about the years 1535-1543. Parts VII.–VIII., with Appendices, including extracts from Leland's Collectanea. Edited by Lucy Toulmin Smith. London: G. Bell & Sons, 1909. Size × 6½, pp. x. and 216. *Maps and Facsimiles. Price 12s. net. Presented by the Publishers.*

Previous parts have been briefly noticed in vol. **30**, p. 435; vol. **31**, p. 559.

United Kingdom—Scotland. **Murray and Pullar.**

Royal Geographical Society. Bathymetrical Survey of the Fresh-water Lochs of Scotland. Under the direction of Sir John Murray and Laurence Pullar. London: Royal Geographical Society, 1908. Size 10 × 7½, pp. vi.i. and 288. *Maps, Illustrations, and Sections. Price (to Fellows) 15s. net.; (to non-Fellows), 21s. net.*

This supplies maps and descriptions of the 349 lochs not dealt with in the *Geographical Journal*. Other volumes will, it is hoped, be issued during 1909, making available, in a uniform series, the whole of the material collected.

ASIA.

Asia. **Keane.**

Stanford's Compendium of Geography and Travel (new issue). Asia. Vol. II. Southern and Western Asia. By Dr. A. H. Keane. Second edition. London: E. Stanford, 1909. Size 8 × 5, pp. xxvi. and 528. *Maps and Illustrations. Price 15s. Presented by the Publisher.*

Central Asia. **Lacoste.**

Commandant de Bouillane de Lacoste. Autour de l'Afghanistan (aux frontières interdites). Paris: Hachette et Cie., 1908. Size 9½ × 7, pp. xxviii. and 224. *Sketch-maps and Illustrations. Price 12 fr. Presented by the Publishers.*

Ceylon—Survey. **Warren.**

Survey Department, Ceylon. Report of Mr. P. D. Warren, Surveyor-General. (Administration Reports, 1907, Part 1.) Size 13 × 8½, pp. 34. *Maps and Illustrations.*

China—Kwangtung. **Diehr.**

M. Seminars Oriental. Sprachen **11** (1908) *I. Abt.*: 189–209.

Bericht über eine Reise in das Innere der Insel Hainan. Von M. Diehr. *Sketch-map.*

China—Yang-tse. *J. Geology* **16** (1908): 587–616. **Abendanon.**

Structural geology of the middle Yang-tzĭ-kiang gorges. By E. C. Abendanon. *Sketch-map, Illustrations, and Sections.*

China—Yunnan. **Lantenois and others.**

Résultats de la mission géologique et minière du Yunnan méridional (Septembre 1903—Janvier 1904). (Par H. Lantenois, Counillon, H. Mansuy, R. Zeiller, et L. Laurent.) Paris, 1907. Size 9 × 5½, pp. 210. *Maps and Sections.*

Chinese Empire. **Brooke.**

Through China to Tibet in 1906. By J. W. Brooke. [London, 1907.] Size 8½ × 5½, pp. 82. *Presented by Mrs. Brooke.*

A privately printed narrative of the late Mr. J. W. Brooke's journey to Tibet (cf. February number, p. 223).

Chinese Empire. **Filchner and Elsner.**

Wissenschaftliche Ergebnisse der Expedition Filchner nach China und Tibet, 1903–1905. IX. Band: Barometrische Höhenmessungen und meteorologische Beobachtungen, bearbeitet von Georg von Elsner. Berlin: E. C. Mittler und Sohn, 1908. Size 10 × 7, pp. viii. and 236. *Plan and Illustration. Price* 16*m. Presented by the Publishers.*

Chinese Empire. **Morse.**

The trade and administration of the Chinese Empire. By Hosea B. Morse. London: Longmans, Green, & Co., 1908. Size 9 × 6½, pp. xvi. and 452. *Maps and Illustrations. Price* 7*s.* 6*d. net.*

Eastern Asia—Saghalien. *J.R. Artillery* **35** (1908): 349–372. **Woodroffe.**

Four weeks in Saghalien. By Captain C. R. Woodroffe. *Illustrations.*

French Indo-China—Crops and Rainfall. **Brenier.**

B. Économique, Indo-Chine **11** (1908): 572–599.

Répartition saisonnière des récoltes et pluviométrie en Indo-Chine. Par H. Brenier. *Map.*

French Indo-China—Geology. **Zeil and others.**

Contribution à l'étude géologique du Haut-Tonkin. Par le Capt. G. Zeil. Note sur la géologie de l'Indo-Chine. Par H. Lantenois. Note sur la géologie du Cambodge et du Bas-Laos. Par René de Lamothe. (Memoires de la Société Géologique de France. 4e Série, Tome 1, Nos. 3–5.) Paris, 1907. Size 3 × 10, pp. 20 and 60. *Maps and Sections. Presented by the Service des Mines, Indo-China.*

French Indo-China—Hydrology. *Spelunca* **7** (1908): No. 52, pp. 28. **Macey.**

Cours d'eau souterrains du Cammon au Laos. Par Paul Macey. *Sketch-maps and Sections.*

French Indo-China—Tonkin. *B. Économique, Indo-Chine* **11** (1908): 694–701. **Saurel.**

Rapport sur la mission de prospection dans la région de Quan-ba (IIIe territoire militaire) 15 Décembre 1907—17 Janvier 1908. Par R. Saurel. *Sketch-map.*

India—Historical. **Surridge.**

'Romance of Empire: India. By Victor Surridge. London: T. C. and E. C. Jack, 1909. Size 8½ × 6, pp. xiv. and 308. *Sketch-map and Illustrations. Price* 6*s. net. Presented by the Publishers.*

India—Meteorology. *J. and P.R. Asiatic S. Bengal* **4** (1908): 43–53. **Little.**

Note on the calm region in the atmosphere above Calcutta, which, during the cold season, is at a height of about 3090 feet. By C. Little. *Diagrams.*

Persia—Historical. **Speelman and Hotz.**

Journaal der reis van den gezant der B.I. Compagnie Joan Cunaeus naar Perzië in 1651–1652, door Cornelis Speelman. Uitgegeven door A. Hotz. Amsterdam:

J. Müller, 1908. Size 9½ × 6, pp. cxvi. and 466. *Map, Plans, and Illustrations. Presented by the Editor.*

Russia—Caucasus—Historical. **Baddeley.**

The Russian conquest of the Caucasus. By John F. Baddeley. London: Longmans, Green, & Co., 1908. Size 10 × 6½, pp. xxxviii. and 518. *Maps and Illustrations. Price* 21*s. net.*

The subject is now for the first time dealt with in a comprehensive way.

Turkey—Armenia. **Campbell.**

In the shadow of the crescent. By J. Alston Campbell. London: Marshall Bros., (1906). Size 8½ × 5½, pp. xii. and 240. *Sketch-map and Illustrations. Presented by the Author.*

Western Asia—Bedawin. **Lees.**

The witness of the wilderness: the Bedawin of the desert; their origin, history, home life, strife, religion, and superstitions, in their relation to the Bible. By the Rev. G. Robinson Lees. London: Longmans, Green, & Co., 1909. Size 8 × 5, pp. xii. and 222. *Illustrations. Price* 3*s.* 6*d. net. Presented by the Publishers.*

AFRICA.

Africa—Historical. **Detlefsen.**

Quellen u. Forschungen, alten Geschichte u. G. (Sieglin) **14** (1908): pp. 104.

Die Geographie Afrikas bei Plinius und Mela und ihre Quellen. Die formulæ provinciarum eine Hauptquelle des Plinius. Von D. Detlefsen.

Africa—"Jigger." *G. Anzeiger* **9** (1908): 270–274. **Kürchhoff.**

Der Sandfloh in Afrika. Von D. Kürchhoff. *Map.*

Algeria—Geology. *B.S.G. Oran* **29** (1908): 263–272. **Gentil.**

Rapport sur les recherches de L. Gentil faites en 1902 dans la région Nédroma-Nemours.

Algeria—Geology. ———

Service Géologique des Territoires du Sud de l'Algérie: Compte-Rendu de la Campagne 1907–1908. Algiers, 1908. Size 10 × 6½, pp. 166. *Maps and Sections. Presented by the Service Géologique des Territoires du Sud.*

Algeria—Oran. *B.S.G. Oran* **29** (1908): 233–262. **Doumergue and Ficheur.**

Notice explicative de la Carte géologique d'Oran. Par MM. Doumergue et Ficheur.

Belgian Congo—Geology. *B.S. Belge Géol., Mém.* **22** (1908): 83–89. **Cornet.**

Contributions à la géologie du bassin du Congo. II. La géologie de l'itinéraire de Kabinda à Kikondia, d'après des échantillons récoltés par M. Lancsweert. Par J. Cornet.

British East Africa—Ethnology. **Hollis.**

The Nandi: their language and folk-lore. By A. P. Hollis. With Introduction by Sir Charles Eliot. Oxford: Clarendon Press, 1909. Size 9 × 5½, pp. xl. and 328. *Map and Illustrations. Price* 16*s. net. Presented by the Delegates of the Press.*

Central Africa. **Foà.**

Résultats scientifiques des voyages en Afrique d'Edouard Foà, publiés sous les auspices du Muséum National d'Histoire Naturelle. Préface de Edmond Perrier. Paris: Imprimerie Nationale, 1908. Size 12½ × 9½, pp. xxxii. and 742. *Maps and Illustrations. Price* 50 *fr.*

East Africa—Commercial. *G.Z.* **14** (1908): 597–614, 666–682. **Kürchhoff.**

Alte und neue Handelsstrassen und Handelsmittelpunkte in Ost-Afrika. Von D. Kürchhoff.

Egypt—Fayum. *B.S. Khédiviale G.* **7** (1908): 109–138. **Apostolidis.**

Étude sur la topographie du Fayoum. Par le Dr. B. Apostolidis. *Map.*

Egypt—Geology. *Geol. Mag.* V. **5** (1908): 500–509. **Hume.**

Notes on the Petrography of Egypt. By W. F. Hume. *Sketch-map.*

Egypt—Irrigation. ———

Public Works Department. Reports upon the administration of the irrigation services in Egypt and in the Sudan for the year 1907. Cairo, 1907. Size 11 × 7½, pp. 48. *Sections, Illustrations, and Diagrams.*

Egypt—Meteorology. ———

Survey Department, Egypt. Meteorological Report for the year 1906. Two parts. Cairo, 1908. Size 14½ × 10½, pp. (part 1) vi. and 66; (part 2) viii. and 202.

Egyptian Sudan—Baer Tribe. *J. African S.* **8** (1908): 75–78. **Struck.**

An unlocated tribe on the White Nile. By Bernhard Struck.

Demonstrates the great probability that the Baer of Petherick are the Dyur (known to the Bongo as Behr, according to Schweinfurth).

Egyptian Sudan—Diseases. **Balfour.**

Third Report of the Wellcome Research Laboratories at the Gordon Memorial College, Khartoum. Andrew Balfour, M.D., Director. London: Published for the Department of Education, Sudan Government, Khartoum, by Baillière, Tindall, & Cox, 1908. Size 11 × 7½, pp. 478. *Maps and Illustrations. Price* 21*s. net. Presented by the Publishers.*

French Congo. **Lenfant.**

Commandant Lenfant. La découverte des grandes sources du centre de l'Afrique. Rivières de vie; rivières de mort; Nana; Ouam; Penndé. Paris: Hachette & Cie., 1909. Size 10 × 6½, pp. xii. and 288. *Map and Illustrations. Price* 12 *fr. Presented by the Publishers.*

French West Africa. *B.S.G. Com. Paris* **30** (1908): 785–864. **Duchesne-Fournet.**

L'Afrique Occidentale Française: ses voies commerciales et ses produits. [Rapport du Mission Duchesne-Fournet.] *Map and Illustrations.*

Madagascar. **Gallieni.**

Général Gallieni. Neuf ans à Madagascar. Paris: Hachette & Cie., 1908. Size 11 × 7½, pp. xvi. and 372. *Maps, Diagrams, and Illustrations. Price* 20 *fr.*

Senegal. **Riembau.**

Frédéric Riembau. De Dakar au Niger: la question du chemin de fer et la mise en valeur des Territoires de la Sénégambie et du Niger. Paris: A. Challamel, 1908. Size 10 × 6½, pp. 124. *Maps and Illustrations. Price* 5 *fr.*

NORTH AMERICA.

America—Political. **Urrutia.**

La evolucion del principio de arbitraje en America. Memoria historico-juridica . . . por Francisco Jose Urrutia. Bogota, 1908. Size 9½ × 6, pp. xvi. and 194.

America—Railways. *Deutsche Rundschau G.* **31** (1908–9): 33–34. ———

Die Eisenbahnen Amerikas. *Map.*

Canada—British Columbia. **Métin.**

Albert Métin. La Colombie britannique: Étude sur la colonisation au Canada. Paris: A. Colin, 1908. Size 9½ × 6½, pp. iv. and 432. *Maps and Illustrations. Price* 12 *fr. Presented by the Publisher.*

See review in the February number (p. 201).

Canada—New Brunswick. **Ells.**

Canada: Department of Mines; Geological Survey. The geology and mineral resources of New Brunswick. By R. W. Ells. Ottawa, 1907. Size 9½ × 6½, pp. 136. *Map.*

Canada—Ontario—Canal. ———

Department of Public Works, Canada. Interim Report, Georgian Bay Ship Canal. Brief description and detailed estimate of cost for proposed waterway. Ottawa, 1908. Size 9½ × 6½, pp. viii. and 70. *Maps and Sections.*

Mexico—Indians. **Starr.**

In Indian Mexico: a narrative of travel and labour. By Frederick Starr. Chicago: Forbes & Co., 1908. Size 9½ × 6½, pp. xii. and 426. *Illustrations. Price* $5 *net.*

United States—Colorado River. **Dellenbaugh.**

A Canyon voyage. The narrative of the second Powell Expedition down the Green-Colorado river from Wyoming, and the explorations on land, in the years 1871 and 1872. By Frederick S. Dellenbaugh. New York and London: G. P. Putnam's Sons, 1908. Size 9 × 6, pp. xx. and 278. *Maps and Illustrations. Price* 15*s. net.*

The author claims that this is the first full narrative of this expedition that has been published.

CENTRAL AND SOUTH AMERICA.

Argentine—Ethnology. *An. Museo La Plata* **1** (1908): 53–152. **Lehmann-Nitsche.**
Resultados generales de la expedición á Jujuy realizada en 1906. Estudios antropologicos sobré los Chiriguanos, Chorotes, Matacos y Tobas (Chaco occidental). Por Robert Lehmann-Nitsche. *Illustrations.*

Argentine—Ethnology. *An. Museo La Plata* **1** (1908): 5–52. **Outes.**
Alfareriás del noroeste Argentino. Por Félix F. Outes. *Illustrations.*

Argentine—Ethnology. **Outes.**
Arqueología de San Blas (Provincia de Buenos Aires). Par Félix F. Outes. (Reprinted from the *Anales de Museo Nacional de Buenos Aires*, tomo xvi.) Buenos Aires, 1907. Size 11 × 7½, pp. 249–275. *Sketch-map and Illustrations.*

Argentine—Ethnology. **Outes.**
Sobre el hallazgo de alfarerías mexicanas en la provincia de Buenos Aires. Por Felix F. Outes. (De la Revista del Museo de La Plata, tomo xv.) Buenos Ayres, 1908. Size 11 × 7½, pp. 284–293. *Illustrations.*

Argentine—Historical. **Leguizamón and others.**
Concolorcorvo. El lazarillo de ciegos caminantes desde Buenos Aires hasta Lima (1773).—Araujo. Guía de Forasteros del Virreinato do Buenos Aires (1803). Notas bibliográficas y biográficas por Martiniano Leguizamón. Buenos Aires, 1908. Size 8½ × 5½, pp. xxii. and 566. *Illustrations, and Facsimile Map and Plan. Presented by the Museo de la Plata.*

Argentine—Tierra del Fuego. *B. Geol. I. Upsala* **8** (1906–7): 169–183. **Andersson.**
Geological fragments from Tierra del Fuego. By J. Gunnar Andersson. *Sketch-maps and Illustrations.*

Brazil—São Paulo. *B. American G.S.* **150** (1908): 652–662. **Ward.**
The southern campos of Brazil. By Robert de C. Ward.

Chile—Surveys.
Republica de Chile. Primera memoria del director de la Oficina de Mensura de Tierras pasada al Señor Ministro de Colonizacion en Abril de 1908. Santiago, 1908. Size 11 × 7½, pp. 228. *Maps. Presented by the Oficina de Mensura de Tierras, Chile.*

Venezuela—Historical. **Altoguirre y Duvale.**
Relaciones geográficas de la Gobernación de Venezuela (1767–68), con prólogo y notas de Angel de Altoguirre y Duvale. Madrid: Real Sociedad Geográfica, 1908. Size 9½ × 6, pp. lii. and 350. *Presented by the Real Sociedad Geográfica, Madrid.*

West Indies. **Bellet.**
Daniel Bellet. Les grandes Antilles: étude de géographie économique. Préface de E. Levasseur. Paris: E. Guilmoto, 1909. Size 9 × 5½, pp. xii. and 316. *Map. Price 6 fr. Presented by the Publisher.*

AUSTRALASIA AND PACIFIC ISLANDS.

Australia. *Proc. R.S. Queensland* **21** (1908): 57–86. **Skertchly.**
The origin of Australia. By Sydney B. J. Skertchly. *Sketch-maps.*
An attempt to controvert current ideas as to the high antiquity of Australia.

Australia—Pastoral Industries. **Privat-Deschanel.**
La G., B.S.G. Paris **18** (1908): 145–168, 239–248.
L'Australie pastorale. Le milieu géographique; l'élevage du mouton mérinos; l'industrie de la laine. Par Paul Privat-Deschanel.

Kerguelen Islands. *B.S.G. Com. Paris* **30** (1908): 660–687. **Richard.**
L'archipel de Kerguélen et les autres îles australes françaises. Par Georges Richard.

New Guinea—British. *Travel and Exploration* **1** (1909): 28–40. **Horsbrugh.**
A naturalist's trip to New Guinea. By Charles Bethune Horsbrugh. *Sketch-map and Illustrations.*
The writer visited the foothills of the Owen Stanley range with a view to securing live specimens of birds.

New Zealand. **Blassneck.**

Neuseeland nach seiner Geschichte und seiner Natur, sowie der materiellen und intellektuellen Entwickelung. Inaugural-Dissertation . . . von M. F. Blassneck. Bonn, 1908. Size 8½ × 5½, pp. viii. and 138. *Map and Diagrams.*

A careful study, though the placing of the historical before the physico-geographical section seems a mistake.

Tasmania. **Smith.**

A naturalist in Tasmania. By Geoffrey Smith. Oxford: Clarendon Press, 1909. Size 9 × 5½, pp. 152. *Map and Illustrations. Price 7s. 6d. net. Presented by the Publishers.*

Tasmania—Ethnology. *T.R.S. Edinburgh* **46** (1908): 365–403. **Turner.**

The Craniology, Racial Affinities, and Descent of the Aborigines of Tasmania. By Principal Sir Wm. Turner. *Illustrations and Diagrams. Presented by the Author.*

Tonga Islands. **Downing.**

The total solar eclipse of 1911, April 28. By A. M. W. Downing. (Reprinted from the *Monthly Notices of the Royal Astronomical Society*, vol. lxix., No. 1.) [London, 1909.] Size 8½ × 5½, pp. 30–32. *Sketch-map.*

Vavau, in the Tonga group, will probably be the most suitably situated spot for the observation of the eclipse.

Western Australia. **Maitland.**

Western Australia, 1908. Geological Survey. Reprint of Bulletins 15, 20, and 23. The Geological Features and Mineral Resources of the Pilbara Goldfield. By A. Gibb Maitland, with an Appendix by A. Montgomery. London: Hudson & Kearns, Ltd., 1908. *Sketch-maps, Plans, Sections, and Illustrations.*

POLAR REGIONS.

Antarctic. **Patron.**

La Antartida Americana. Par Luis Riso Patron. (Publicado en los Anales de la Universidad de Chile.) Santiago, 1908. Size 10 × 7, pp. 26. *Map.*

Antarctic—German Expedition. **Drygalski.**

Deutsche Südpolar-Expedition, 1901–1903. Im Auftrage des Reichsamtes des Innern herausgegeben von Erich von Drygalski. I. Band, Heft 2 (pp. 97–282. VIII. Band, Heft 2 (pp. 177–220); X. Band (Zoologie, II. Band), Hefte 1–3 (pp. 1–322.) Berlin: G. Reimer, 1908. Size 14 × 10½. *Maps and Illustrations. Presented by the Imperial Foreign Office, Berlin.*

Antarctic—Scottish Expedition. **Bruce.**

Scottish National Antarctic Expedition. Report on the Scientific Results of the voyage of S.Y. *Scotia* during the years 1902, 1903, and 1904, under the leadership of William S. Bruce. Vol. **4** (Zoology), part I. (pp. xiv. and 104); and Vol. **5** (Zoology) (pp. viii. and 314). Edinburgh: Scottish Oceanographical Laboratory, 1908. Size 12½ × 9½. *Maps and Illustrations. Purchased.*

Arctic—North-West Passage. **Mikkelsen.**

Conquering the Arctic Ice. By Ejnar Mikkelsen. London: W. Heinemann, 1909. Size 9 × 5½, pp. xviii. and 470. *Maps and Illustrations. Price 20s. net. Presented by the Publisher.*

Greenland. *M. k.k. G. Ges., Wien* **51** (1908): 323–335. **Stiasny.**

Eine Reise nach Westgrönland. Von Dr. Gustav Stiasny.

Volkslieder und Sagen der westgrönlandischen Eskimo. By the same.

Polar Transport. **Arctowski.**

Le problème de l'auto polaire. Par Henryk Arctowski. [Brussels], 1908. Size 9½ × 6½, pp. 6.

PHYSICAL AND BIOLOGICAL GEOGRAPHICAL.

Climatology. **König.**

Der Vertrocknungsprozess der Erde und Deutschlands verkehrte Wasserwirtschaft. Von Fr. König. Leipzig: O. Wigand, 1908. Size 9½ × 6, pp. iv. and 108. *Price 3s. 6d.*

Dew-ponds. **Martin.**

Some considerations concerning dew-ponds. By Edward A. Martin. (Reprinted

from the *Transactions of the South-Eastern Union of Scientific Societies*, 1908.) Size 8½ × 5½, pp. 66–85.

Geological History. *J. Geology* **16** (1908): 158–190, 255–295, 363–384. **Barrell.**

Relations between climate and terrestrial deposits. By Joseph Barrell.

Geological History. **Kossmat.**

Sammlung Göschen (Nr. 406). Paläogeographie (Geologische Geschichte der Meere und Festländer.) Von Dr. Franz Kossmat. Leipzig: G. J. Göschen, 1908. Size 6½ × 4, pp. 136. *Maps. Price* 80 *pfg. Presented by the Publisher.*

A clear summary of the general results of recent work on the vicissitudes of land and sea in geological times.

Geology. **Löwl.**

Geologie. Von Dr. Ferdinand Löwl. (Die Erdkunde, . . . herausgegeben von M. Klar, xi. Teil.) Leipzig, etc.: F. Deuticke, 1906. Size 10 × 7, pp. viii. and 332. *Sections and Illustrations. Price* **10m.**

See vol. **25**, p. 667, for a review of the first issues of this series.

Geomorphology. **Johnson and Matthes.**

The relation of geology to topography. By Douglas Wilson Johnson and François E. Matthes (reprinted from 'Principles and Practice of Surveying,' vol. **2**, by Charles B. Breed and George L. Hosmer). New York, 1908. Size 9 × 6, pp. 247–266. *Sketch-maps.*

Geomorphology. **Spethmann.**

"Hartling" für monadnock. "Nachrumpf" und "Vorrumpf." Von Hans Spethmann. (Separat-Abdruck aus dem Centralblatt für Mineralogie, u.s.w., Jahrgang 1908, No. 24.) Stuttgart, 1908. Size 8½ × 5½, pp. 747–748.

Suggests the above terms as pointing to the special characteristics of the respective forms of surface.

Geophysics. **Joly.**

British Association for the Advancement of Science; Dublin, 1908. Uranium and Geology: Address to the Geological Section. By Prof. John Joly. London, 1908. Size 8½ × 5½, pp. 20. *Diagram.*

On the part played by radio-active substances in the economy of the Earth's crust.

Geophysics—Motion of the Pole. **Millosevich.**

Scritti G. e Storia G. concernenti l'Italia (1908): 1–19.

L'Italia nel problema degli spostamenta del polo sul geoide. Di Elia Millosevich. *Illustrations and Diagrams.*

Glacial Epoch. **Arctowski.**

La question des climats de l'époque glaciaire. Par Henryk Arctowski. (Extrait du No. 6, 1908, du Bulletin de la Société Belge d'Astronomie.) Brussels, 1908. Size 9½ × 6, pp. 8.

Glaciers. **Arctowski.**

L'histoire des glaciers. Par Henryk Arctowski. (Extrait de 'Ciel et Terre,' 29e Année.) Brussels, 1908. Size 9 × 6, pp. 10.

Gravity. **Hecker.**

Zentralbureau der Internationalen Erdmessung: Neue Folge der Veröffentchungen, Nr. 16. Bestimmung der Schwerkraft auf dem Indischen und Grossen Ozean und an deren Küsten, sowie erdmagnetische Messungen. Von Prof. Dr. O. Hecker. Berlin: G. Reimer, 1908. Size 11½ × 9, pp. viii. and 234. *Maps, Illustrations, and Diagrams.*

Gravity. *Skrifter Videnskabs-S. Christiania*, 1907 (1908), No. 6, pp. 28. **Schiøtz.**

Ueber die Schwerkraft auf dem Meere längs dem Abfall der Kontinente gegen die Tiefe. Von O. E. Schiøtz.

Meteorology. **Trabert.**

Meteorologie und Klimatologie. Von Dr. Wilhelm Trabert. (Die Erdkunde; herausgegeben von M. Klar; xiii. Teil.) Leipzig, etc.: F. Deuticke, 1905. Size 10 × 7, pp. vi. and 132. *Sketch-maps, Diagrams, and Illustrations. Price* 4*m.*

Some earlier volumes of the series were reviewed in vol. **25**, p. 667.

Meteorology—Congress.

Report of the eighth meeting of the International Meteorological Committee, Paris, September, 1907. (Meteorological Office, No. 197.) London, 1908. Size 9½ × 6, pp. 102.

Meteorology—Humidity. *B.A. Imp. Sc., St. Petersburg* (1908): 819–834. **Rikachef.**

The influence of the nature of the Earth's surface on the diurnal variation of absolute humidity. By M. M. Rikachef. *Diagrams.* [In Russian.]

Meteorology—Pressure. **Chrystal.**

On the theory of the leaking microbarograph, and on some observations made with a triad of Dines-Shaw instruments. By Prof. [G.] Chrystal. (Reprint from the *Proceedings of the Royal Society of Edinburgh*, vol. **28**, part 6.) Edinburgh, 1908. Size 10 × 7, pp. 437–460. *Diagrams.*

Oceanography—Deposits. **Murray and Philippi.**

Die Grundproben der "Deutschen Tiefsee Expedition.' Von Sir John Murray und Prof. E. Philippi. (Abdruck aus "Wiesenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer *Valdivia* 1898–1899." . . . x. Band, 4 Lieferung.) Jena: G. Fischer, 1908. Size 13 × 10, pp. 77–206. *Charts and Illustrations. Presented by Prof. Dr. E. Philippi.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography. *B. American G.S.* **40** (1908): 522–530. **Tower.**

The human side of systematic geography. By Dr. Walter Sheldon Tower.

Anthropogeography—Early Trade. **Roth.**

Trading in Early Days. By H. Ling Roth. (A lecture delivered before the Halifax Scientific Society, September 30, 1908.) Halifax: F. King & Sons, Ltd., 1908. *Sketch-maps, Chart, and Illustrations.*

Commercial—Gold. **Maclaren.**

Gold: its geological occurrence and geographical distribution. By Dr. J. Malcolm Maclaren. London: *The Mining Journal*, 1908. Size 10 × 6, pp. xxiv. and 688. *Sketch-maps, Sections, and Illustrations. Presented by the Author.*

Commercial—Steamships. *Z. Ges. E. Berlin*, 1908: 688–705. **Zahn.**

Das Verkehrsgebiet der Hamburg-Amerika Linie und des Norddeutschen Lloyd. Von Dr. Gustav W. v. Zahn.

Commercial—Vine. *B.S. Neuchatel. G.* **19** (1908): 120–143. **Clerget.**

La géographie de la vigne et la crise viticole. Par Pierre Clerget. *Diagrams.*

History of Cartography. **Longhena.**

Scritti G. e Storia G. concernenti l'Italia (1908): 251–291.

Appunti di storia della cartografia seguiti dal periplo dell' Italia desunto da 11 mappe. Di Mario Longhena.

Tropical Medicine. **Balfour and Archibald.**

Review of some of the recent advances in tropical medicine, hygiene, and tropical veterinary science, with special reference to their possible bearing on medical, sanitary, and veterinary work in the Anglo-Egyptian Sudan; being a supplement to the Third Report of the Wellcome Research Laboratories at the Gordon Memorial College, Khartoum. By Andrew Balfour and R. G. Archibald. London: Published for Department of Education, Sudan Government, Khartoum, by Baillière, Tindall & Cox, 1908. Size 11 × 7½, pp. 252. *Map. Price* 10*s.* 6*d. net. Presented by the Publishers.*

BIOGRAPHY.

Brown.

George Brown, D.D., pioneer-missionary and explorer: an autobiography. A narrative of forty-eight years' residence and travel in Samoa, New Britain, New Ireland, New Guinea, and the Solomon Islands. London: Hodder & Stoughton, 1908. Size 9½ × 6, pp. xii. and 536. *Map, Portrait, and Illustrations. Price* 15*s. net. Presented by the Publishers.*

Gioja. *Scritti G. e Storia G. concernenti l'Italia* (1908): 371–400. **Jaja.**

Il criterio ed il metodo geografico di Melchiorre Gioja. Di Goffredo Jaja.

Malte Brun. **Frenzel.**

Malthe Conrad Bruun (Malte-Brun); Frankreichs bedeutendster Geograph im ersten Viertel des 19. Jahrhunderts. Ein Beitrag zur Geschichte der geographischen Wissenschaft. Inaugural-Dissertation . . . von Reinhard Frenzel. Crimmitschau, 1908. Size 8½ × 5½, pp. 128. *Price* 1*s.* 9*d.*

GENERAL.

Educational—Appliances. *Scottish G. Mag.* **24** (1908): 643–652. **Hobbs.**

Apparatus for instruction in geography and structural geology. By Prof. William H. Hobbs. *Illustrations and Diagrams.*

Exploration. *Travel and Exploration* **1** (1909): 1–6. **Markham.**

The Nasamonians: a call to exploration. By Sir Clements R. Markham. *Portrait.*

French Colonies. **Zimmermann.**

La valeur de notre domaine coloniale. Par Maurice Zimmermann. (Rapport extrait du Compte rendu analytique des séances de la Société d'Economie politique et sociale de Lyon pour l'année 1907-08.) Lyons, 1908. Size 8½ × 5½, pp. 278–350.

Geneva Geographical Society. *Le Globe, Mém. S.G. Genève* **47** (1908): 43–76.

Célébration du cinquantième anniversaire de la fondation de la Société de Géographie de Genève.

Geography. *B.R.S.G. Madrid* **50** (1908): 359–372. **Beltrán y Rózpide.**

El ideal geográfico y los progresos de la geografía. Por Ricardo Beltrán y Rózpide.

Geography. *Questions Diplomatiques* **26** (1908): 106–117. **Louis-Jaray.**

La géographie nouvelle. Par Gabriel Louis-Jaray.

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Austria. **Freytag.**

G. Freytag's Ausflugskarte. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets: x., xii., xx. Vienna: G. Freytag & Berndt, [1909]. *Presented by the Publishers.*

A set of tourists' maps of different parts of Austria.

Austria. **Freytag.**

Karte des Landes Vorarlberg. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Vienna: G. Freytag & Berndt, [1909]. *Price 15 heller. Presented by the Publishers.*

Austria. **Freytag and Berndt.**

Karte des politischen Bezirkes Hietzing-Umgebung. Scale 1 : 25,000 or 2·5 inches to 1 stat. mile. 4 sheets. Vienna: G. Freytag & Berndt, [1909]. *Presented by the Publishers.*

A large-scale boldly executed map, suitable for hanging on a wall, of the Hietzing suburb of Vienna. Relief is shown by brown contours at 10 metre intervals, and the map is printed in colours.

Austria. **K.K. Evang. Oberkirchenrate Augsb. u. Helv. Bek.**

Uebersichtskarte der evangelischen Kirche Augsburgischen und Helvetischen Bekenntnisses in Österreich. Herausgegeben vom k.k. evang. Oberkirchenrate Augsburgischen und Helvetischen Bekenntnisse 1908. Scale 1 : 1,000,000 or 1 inch to 15·8 stat. miles. 2 sheets. Vienna: Freytag & Berndt, 1908. *Presented by the Publishers.*

The distribution and location of these churches in Austria are clearly indicated by coloured symbols, in addition to which further information on the subject is given in tabular form. The map shows the position up to the second of December last.

Austria—Vienna. **Freytag.**

G. Freytag's Verkehrsplan der k.k. Reichshaupt- und Residenzstadt Wien, 1909. Scale 1 : 15,000 or 4·2 inches to 1 stat. mile. *Price 1.50 kr.*—Neuester Orientierungsplan von Wien. Scale 1 : 15,000 or 4·2 inches to 1 stat. mile. *Price 60 heller.* Vienna: G. Freytag & Berndt, 1909. *Presented by the Publishers.*

Austria-Hungary. **Freytag.**

Die Grenzgebiete Österreich-Ungarns und Serbiens. Von G. Freytag. Scale 1:1,250,000 or 1 inch to 19·7 stat. miles. Vienna: G. Freytag & Berndt, 1909. *Price* 45 *pf. Presented by the Publishers.*

Austria-Hungary. **Rothaug.**

Politische Karte der Österreichisch-Ungarischen Monarchie nebst angrenzenden Gebieten. Bearbeitet von J. G. Rothaug. Scale 1:4,000,000 or 1 inch to 63·1 stat. miles. Vienna: G. Freytag & Berndt, [1909]. *Presented by the Publishers.*

Balkan Peninsula. **Peucker.**

Generalkarte von Serbien und Montenegro. Bearbeitet von Dr. Karl Peucker. Scale 1:864,000 or 1 inch to 13·6 stat. miles. Vienna: Artaria & Co., 1909. *Price* 2.40 *kr. Presented by the Publisher.*

A small general map of Servia and Montenegro, based upon Scheda's well-known map of the Balkan States, and brought up to date by Dr. Karl Peucker. Political, commercial, and other statistics are given in tabular form.

British Isles. **Philip.**

Philips' Handy Administrative Atlases of Scotland and Ireland. Detailed county maps, showing Local Government and Parliamentary Divisions, with lists of Royal and Municipal Burghs, Police Burghs, County Districts, Parliamentary Burghs and Divisions, and Consulting Index. Edited by George Philip, F.R.G.S. London: George Philip & Son, Ltd., [1909]. *Price* 3*s. net each. Presented by the Publishers.*

Useful little atlases in which an attempt has been made to present, in a complete and convenient form, administrative divisions as they exist at the present time for all purposes of Local Government and Parliamentary representation. The atlas of England and Wales belonging to the same series was noticed in a recent number of this *Journal*. The maps would have been clearer, and greatly improved in appearance if they had not been so highly coloured.

British Isles—Birmingham. **Bartholomew.**

Plan of Birmingham. By J. Bartholomew, F.R.G.S. Scale 1:19,000 or 3·3 inches to 1 stat. mile. Edinburgh: John Bartholomew & Co., [1909]. *Price, mounted on cloth,* 2*s. net. Presented by the Publishers.*

This plan, which has an index to streets and public buildings, has been revised and extended.

British Isles—England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from March 1 to 31, 1909.

County diagrams, 4 miles to 1 inch, showing civil parishes, with a table of their areas. Sutherland. *Price* 6*d.*

2 miles to 1 inch:—

Large-sheet series, printed in colours, folded in covers or flat in sheets. Hills shown by the "layer system," 2, 8, 11, 15, 16, 20, 21, 22, 26. *Price, on paper,* 1*s.* 6*d.; mounted on linen,* 2*s.; mounted in sections,* 2*s.* 6*d. each.*

1-inch (third edition):—

In outline, 168. 1*s.* (engraved).

With hills in brown or black, 168, 174, 183, 310. *Price* 1*s. each* (engraved).

Large-sheet series, printed in colours, and folded in cover or flat in sheets, 48, 63, 64, 73, 144. *Price, on paper,* 1*s.* 6*d.; mounted on linen,* 2*s.; mounted in sections,* 2*s.* 6*d. each.*

6-inch—County Maps:—

Cornwall (First Revision), 62 N.W., 70 S.W., 74 N.W., N.E., 75 S.E. (82 N.W., S.W.), 87 N.E., 89 N.W. **Hampshire** (Second Revision), 90 N.E., S.E., 96 N.W., 97 N.W., N.E., 98 N.E., S.W., S.E., 99 S.W., 100 N.W. **Kent** (Second Revision), 4 S.E., 13 S.W., 21 N.E., 33 N.E., 53 S.W., 54 S.W., 63 N.E., 72 S.W., 78 N.E., 79 N.W., N.E., 80 N.W. **Lancashire** (First Revision of 1891 Survey), 83 N.W., 84 N.W., 85 N.W., 90 N.W., S.E., 91 N.W., S.W., S.E., 92 S.W., S.E., 98 N.E., S.E., 99 N.E., 100 N.W., 101 N.W., N.E., S.W., 103 N.W., S.W., 108 N.W. (113 S.W. and S.E.). **Pembrokeshire** (First Revision), (31*a* S.W. and 31*c* S.E.), 33 S.W., 38 S.E., 39 N.E. **Yorkshire** (First Revision of 1891 Survey), 191 S.W., 203 N.W., N.E., 204 N.W., S.W., S.E., 205 N.E., 206 N.W., 216 N.W., S.W., 217 N.W., 271 S.W. *Price* 1*s. each.*

1:2500 Scale—County Maps:—

Cheshire (Second Revision), XXXVII. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; XLIV. 1, 3, 9, 11, 14. 3*s. each;* XLIV. 12 (LII. 1 and 2). 1*s.* 6*d. each.* **Hamp-**

shire (Second Revision), LXII. 7, 11, 14, 15, 16; LXIII. 13, 14, 15, 16; LXIV. 13, 14, 15; LXVII. 6, 10; LXX. 3, 4, 6, 7, 8, 10, 12, 14, 15, 16; LXXI. 1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16; LXXII. 1, 3, 4, 6, 7, 8, 9, 10, 12, 13, 14, 15, 16; LXXIII. 5; LXXIV. 2, 6; LXXVI. 6; LXXVIII. 1, 4; LXXIX. 1, 2, 4, 5, 7, 8, 11, 14, 16; LXXX. 1, 3, 5, 7, 11; LXXXII. 8; LXXXVII. 4. *3s. each.* LXII. 5, (10 and 6); LXX. (5 and 1), 9, 13. *1s. 6d. each.* **Kent** (Second Revision) IX. 8, 12; X. 1, 10; XI. 16; XII. 13; XV. 14 (16 and 15); XVI. 13; XVII. 5, 9, 10; XIX. 10, 12, 13, 14; XX. 1, 5; XXVII. 4, 8, 12; XXVIII. 1, 5, 9; XXXIX. 6, 10; XL. 9; XLIX. 2, 4; L. 15, 16; LI. 13; LXI. 9. *3s. each;* XXVII. 16; XXXIX. 1. *1s. 6d. each.* **Lancashire** (First Revision of 1891 Survey), LXXXVI. 9, 10, 13, 14; XCIII. 4; XCIV. 2; CV. 2, 7. **Yorkshire** (First Revision of 1891 Survey), CXLVIII. 1, 10, 14; CXLIX. 6, 9, 11, 13; CL. 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16; CLI. 7, 8, 12, 13, 15; CLXV. 1, 16; CLXVII. 3, 4, 8, 12, 13, 14, 15; CLXVIII. 1, 2, 3, 4, 6, 7, 8, 9, 12; CLXIX. 1, 8, 10, 14; CLXX. 5, 6, 7, 10, 15; CLXXIV. 3, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16; CLXXXV. 1, 3, 5, 13; CLXXXVI. 2, 3, 4; CLXXXIX. 5, 7; CXC. 9, 13.

(*E. Stanford, London Agent.*)

England and Wales. **Geological Survey.**

1-inch map.

New series, colour-printed. Drift Edition, 43. *Price* 1*s.* 6*d.*

(*E. Stanford, London Agent.*)

British Isles—London. **Stanford.**

A new map of Metropolitan Railways, Tramways, and Miscellaneous Improvements deposited at the London County Council, November 30, 1908, for session 1909. Scale 1:63,360 or 1 inch to 1 stat. mile. London: Edward Stanford, 1909. *Price* 1*s.* 6*d.*

British Isles—Scotland. **Bartholomew.**

Bartholomew's Contoured Road-map of Scotland, showing the main roads and railways. Scale 1:633,600 or 1 inch to 10 stat. miles. Edinburgh: John Bartholomew & Co., [1909]. *Price, mounted in cloth, 2s. net. Presented by the Publishers.*

A useful general map for tourists and others, showing relief on the "layer" system of colour tinting.

Europe. **K. Preuss. Landesaufnahme.**

Uebersichtskarte von Mitteleuropa herausgegeben von der Kartographischen Abteilung der Königlich Preussischen Landesaufnahme. Scale 1:300,000 or 1 inch to 4·7 stat. miles. Sheets: Amsterdam, Hannover, Osnabrück. Berlin: K. Preuss. Landesaufnahme, 1908. *Price* 1.50*m. each sheet.*

Holland. **Topographical Bureau, The Hague.**

Chromo-topographische Kaart van het Koninkrijk der Nederlanden. Scale 1:50,000 or 1·3 inch to 1 stat. mile. Sheets: 5, Harlingen; 54, Neuzen. The Hague: Topographical Bureau, [1909].

Norway. **Norges Geografiske Opmaaling.**

Topografisk Kart over Kongeriget Norge. Scale 1:100,000 or 1 inch to 1·6 stat. mile. Sheets: K. 8, Öksnes: 25 B, Gjövik.—Nordre Trondhjems Amt. III. (nordøst). Christiania: Norges Geografiske Opmaaling, 1906-08. *Presented by the Norwegian Geographical Institute.*

ASIA.

China—Peking. **Service Géographique de l'Armée, Paris.**

Plan de Pékin. Scale 1:15,000 or 4·2 inches to 1 stat. mile. Paris: Service Géographique de l'Armée, [1908]. *Price* 1.50 *fr.*

Malay States—Negri Sembilan. **Wallace and Young.**

Map of Negri Sembilan, Federated Malay States, 1907. Scales 1:126,720 or 1 inch to 2 stat. miles, 2 sheets, and 1:253,440 or 1 inch to 4 stat. miles. Compiled from the records of the Survey, the Public Works, and the Railway Departments, by W. A. Wallace, Surveyor, Trigonometrical Department, under the direction of Alfred E. Young, F.R.A.S., Chief Surveyor, Federated Malay States. Taiping: Trigonometrical Department, Federated Malay States Surveys, 1907. *Presented by the Surveyor-General, Federated Malay States.*

The same map on two scales, the smaller one being reduced to half the scale of the larger by photography. Much useful information is given, and agricultural and mining

alienated lands are shown by colour; but the maps are somewhat disfigured by the crude manner in which the hills are shown.

AFRICA.

Africa. **Johnston.**

Bathy-Orographical map of Africa. Scale 1 : 8,400,000 or 1 inch to 133 stat. miles. Edinburgh: W. & A. K. Johnston, Ltd., 1909. *Price* 12*s.*, *mounted on rollers and varnished. Presented by the Publishers.*

Egypt. **Survey Department, Cairo.**

Map of Egypt. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheets: N.W. III.–I. Menuf; N.E. III.–I. Benha: V.–III. Abu el Shequq; V.–IV. San el Hagar. Cairo: Survey Department, 1908. *Presented by the Director-General, Survey Department, Cairo.*

Morocco. **Larras.**

Cartes de reconnaissance du Maroc levées et dessinées par le Capitaine N. Larras 1898–1906. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheet: Mogador-Taroudant. Paris: Henry Barrère, [1909]. *Presented by the Publisher.*

This sheet includes Mogador and the country to the south-east as far as Taroudant. In addition to the route sketches, inset plans on larger scales are given of Mogodor, Taroudant, and Agadir Ir'ir.

Morocco. **Service Géographique de l'Armée, Paris.**

Carte du Maroc. Scale 1 : 500,000 or 1 inch to 7·9 stat. miles. Sheet: 8, Figuig. Paris: Service Géographique de l'Armée, 1908. *Price* 1 *fr. each sheet.*

South Africa. **Johnston.**

The World-Wide Series of Library and Office Maps. South Africa. Scale 1 : 2,500,000 or 1 inch to 40 stat. miles. 2 sheets. Edinburgh: W. & A. K. Johnston, Ltd., 1909. *Price* 10*s. net. Presented by the Publishers.*

A useful general map of Africa south of the Zambezi, showing political divisions, means of communication, and location of minerals.

Tunis. **Babelon, Cagnat, and Reinach.**

Atlas Archéologique de la Tunisie. Édition Spéciale des Cartes Topographiques publiées par le Ministère da la Guerre accompagnée d'un Texte Explicatif par MM. E. Babelon, R. Cagnat, S. Reinach. 12e Livraison. Paris: Ernest Leroux, [1909].

Special edition of the Kef Abbed, Zaouiet Medienn, Teboursouk, and Bon Arador sheets of the 1 : 50,000 French Government survey of Tunis, with archæological information and names of ancient sites added in red. Each sheet is accompanied by one or two pages of text.

Tunis. **Service Géographique de l'Armée, Paris.**

Carte de la Tunisie. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheet: LXXIX. Tozeur. Paris: Service Géographique de l'Armée, [1909]. *Price* 1.20 *fr. each sheet.*

AMERICA AND WEST INDIES.

Canada. **Department of the Interior, Ottawa.**

Sectional map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheets: 117, Red Deer Forks, revised to August 15, 1908; 121, Riding Mountain, revised to November 10, 1908; 166, Sounding Creek, revised to September 25, 1908; 214, Rocky Mountain House, revised to October 29, 1908; 218, Saskatoon, revised to August 18, 1908; 268, Carlton, revised to October 6, 1908; 269, Prince Albert South, revised to September 21, 1908; 317, Fort Pitt, revised to September 12, 1908; 365, Victoria, revised to November 24, 1908. Ottawa: Department of the Interior, Topographical Surveys Branch, 1908. *Presented by the Department of the Interior, Ottawa.*

Chile. **Oficina de Mensura de Tierras, Santiago.**

Comision Chilena de Limites. Mapas de la Rejion-Andina. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheets: Antofagasta, Curicó-Talca, Concepcion-Bio-Bio, Cautin-Valdivia, Valdivia-Llanquihue, Tacna. Santiago: Oficina de Mensura de Tierras, 1908. *Presented by the Director, Oficina de Mensura de Tierras, Santiago.*

This series of sheets, based on the recent surveys of the Chilian Boundary Commission, is now complete, and with this issue are given the index, title, and table of

contents. The arrangement of publishing the triangulation and traverse charts to accompany each of the topographical sheets, which has been referred to in this *Journal*, is certainly to be commended, and on the whole the work has been satisfactorily accomplished, notwithstanding the fact that the execution of the maps is somewhat rough as compared with other maps of a similar character.

Chile. **Oficina de Mensura de Tierras, Santiago.**

Atlas de la Republica de Chile. Scale 1 : 500,000 or 1 inch to 7·8 stat. miles. Sheet: Taltal-Chanaral. Santiago: Oficina de Mensura de Tierras, 1908. *Presented by the Director, Oficina de Mensura de Tierras, Santiago.*

United States. **Rand, McNally & Co.**

Indexed County and Railroad Pocket Map and Shippers' Guide of New York. Scale 1 : 570,240 or 1 inch to 9 stat. miles. Chicago: Rand, McNally & Co. New edition. 1909.

United States. **Rand, McNally & Co.**

New Handy Map of New York City. Scale 1 : 25,000 or 2·5 inch to 1 stat. mile. Chicago: Rand, McNally & Co., 1909.

West Indies—Haiti. **Tippenhauer.**

Topographische und geologische Karte des zentralen Teiles der Republik Haïti zwischen der Meereskuste bei Arcahaie und der Grenze bei Banica einerseits und der Cul-de-Sac-Ebene und Maïssade, Cerca-Carvajal andererseits. Aufgenommen und gezeichnet von L. Gentil Tippenhauer. Scale 1 : 150,000 or 1 inch to 2·4 stat. miles. *Petermanns Mitteilungen*, Jahrgang 1909, Tafel 5. Gotha: Justus Perthes, 1909. *Presented by the Publisher.*

Generalizes the results of Herr L. Gentil Tippenhauer's topographical and geological surveys in the Republic of Haiti during last year. Relief is shown by brown form lines, and geology by colours and symbols. The map accompanies the author's paper in *Petermanns Mitteilungen* for March last.

POLAR REGIONS.

Antarctic Regions. **Johnston.**

South Polar Chart showing the approximate route of Lieut. Shackleton's expedition. Edinburgh: W. & A. K. Johnston, Ltd., [1909]. *Price* 1*s.* 6*d. Presented by the Publishers.*

This is the new Royal Atlas map of the South Polar Regions, with Lieut. Shackleton's work added.

GENERAL.

World. **Dickinson and Andrews.**

Philips' "Diagram" Hand Atlas. Designed by B. B. Dickinson, M.A., F.R.G.S., and A. W. Andrews, M.A., F.R.G.S. Containing 30 coloured hand maps. London: George Philip & Son, Ltd., [1909]. *Price* 3*s. net. Presented by the Publishers.*

This atlas consists of the orographically coloured Diagram Hand Maps which have been published separately, and from time to time noticed in this *Journal*.

World. **Philip.**

Philips' Comparative Series of Outline Physical Maps: Central and South Africa. Scale 1 : 20,000,000 or 1 inch to 316 stat. miles. South-Eastern Asia. Scale 1 : 25,000,000 or 1 inch to 395 stat. miles. Australasia and Polynesia. Scale 1 : 50,000,000 or 1 inch to 799 stat. miles. London: George Philip & Son, Ltd., [1909]. *Price* ½*d. each. Presented by the Publishers.*

These maps are a companion series to Philips' 'Elementary Atlas of Comparative Geography,' and are designed to supply a set of outlines corresponding to the coloured originals, for map drawing, test questions, exercises, etc.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during February, 1909. *Presented by the Hydrographer, Admiralty.*

New Charts.

No.	Inches.	
3674 m =	0·4	Scotland, west coast, southern approach to the Minch:—Colonsay to north point of Skye. 4*s.*
974 m =	14·7	Malta island:—Valetta harbours. 3*s.*

No.	Inches.	
3716 m =	3·9 3·9 1·8	British Columbia:—Plans in Graham island:—Parry passage. Virago sound and Naden harbours. Plan:—The bar and Alexandra narrows. 3s.
3720 m =	0·36	Borneo, west coast:—Pontianak to Tanjong Bayung. 3s.
2104 m =	0·35	Borneo:—Tanjong Bayung to Tanjong Datu, including South Natuna islands. 3s.
964 m =	3·0	Plans in Borneo:—Kudat harbour. 3s.

Charts Cancelled.

No.		Cancelled by	No.
195	Malta island:—Valetta harbours and the coast westward to Madalena point.	New chart.	
974	Malta island:—Valetta harbours.	Valetta harbours	971
2168	British Columbia:—Ports, etc., in Queen Charlotte islands. Plan of Virago sound on this sheet.	New chart. Plans in Graham island:—Parry passage, the bar and Alexandra narrows, Virago sound and Naden harbour	3716
2104	Borneo, sheet I.:—South Natuna islands.	New chart. Tanjong Bayung to Tanjong Datu, including South Natuna islands	2104
946	Borneo:—Kudat harbour.	New chart. Plans in Borneo:—Kudat harbour . . .	946

New Editions.

No. 1967, England, south coast:—Plymouth sound. 1934, England, east coast:—River Tyne entrance. 3258, England, east coast:—River Tyne, Jarrow slake to Elswick. 2845, Channel islands:—Alderney harbour. 3140, Channel islands:—St. Peter Port. 1448, Spain:—Acebuche point to Chullera point, including Gibraltar bay. 2628, Malta island, south-east portion. 2740, Iceland and the Færoe islands. 565, Iceland, western portion. 2976, Iceland:—Snefells Jokel to North cape. 566, Iceland, eastern portion. 1690, Newfoundland:—Hawke bay to Ste. Genevieve bay, including St. John bay. 903, North America, east coast:—Gouldsborough bay to Little Spoon island 1001, Plans on the west coast of Africa:—Anchorage of St. Louis, etc. 2621, India, west coast:—Bombay harbour. 1995, Malacca strait:—Singapore road. 2350, Australia, east coast:—Double point to Cape Grafton. 2924, Australia, east coast:—Cape Grafton to Hope island. 1970, New Zealand:—Auckland harbour. 1423, New Zealand:—Port Nicholson. 1999, New Zealand:—Ports Lyttelton and Levy. 2411, New Zealand:—Otago harbour from the entrance to Dunedin. 214, Solomon islands. 1469, Solomon islands:—Guadalcanar and Florida islands.

Indian Ocean and Red Sea. **Meteorological Office.**

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, April, 1909. London: Meteorological Office, 1909. *Price 6d. each. Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic Ocean, March, 1909. Washington: U.S. Hydrographic Office, 1909. *Presented by the U.S. Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Monthly meteorological charts of the North Atlantic and Mediterranean, April, 1909. London: Meteorological Office, 1909. *Price 6d. each. Presented by the Meteorological Office.*

North Pacific. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, April, 1909. Washington: U.S. Hydrographic Office, 1909. *Presented by the U.S. Hydrographic Office.*

Norway. **Norges Geografiske Opmaaling.**

Kystkarter. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Specialkart B 2, Kristianfjorden fra Bastö til Lille Færder. Specialkart B 34, Norske Kyst fra Ona til Fuglen og Kvitholmen. Specialkart B 51, Norske Kyst fra Dönna til Lurö. Bilag til Generalkart B 9, Tjelsundet fra Balstadströmmen til Grœsholmen. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Bilag til Generalkart B 14, Indlöpet til Kirkenes (Sydvaranger). Scale 1 : 100,000 or inch to 1·6 stat. mile. Christiania: Norges Geografiske Opmaaling, 1909. *Presented by the Norwegian Geographical Institute.*

PHOTOGRAPHS.

China. **Davies and Hilton-Johnson.**

Ninety-seven photographs of the Shan-tung, Chiang-su, and Chiang-hsi provinces, China, taken by Major H. R. Davies, 52nd Oxfordshire Light Infantry, and Captain A. H. Hilton-Johnson, the Lincolnshire Regiment, in 1907 and 1908. *Presented by Major H. R. Davies.*

This Society is already indebted to Major H. R. Davies for many excellent photographs taken during his travels in the East. These he now presents are from his latest journey, and, as the titles will show, form a valuable addition to our collection. They are mounted in three volumes, and carefully described.

(1) Typical scenery near the Chiang-su border; (2) Typical scenery near Jih-chou-hsien; (3) View from the road up the T'ien-Ch'i-Ling; (4) The Hsing-ts'un valley; (5) Near Mao-tzŭ; (6–8) Near Wei-hai-wei; (9 and 10) Mud-walled villages; (11 and 12) Typical villages, eastern Shan-tung; (13) The island at Wei-hai-wei; (14) The Shan-tung promontory; (15) A graveyard; (16) Temple in a field; (17) Donkey market; (18) A hollow road; (19) Typical village; (20) Loaded mule; (21) A load of kaoliang; (22) A middle-sized station on the Shan-tung railway; (23) A family removal; (24) A bridal wheelbarrow; (25) An engine on the Shan-tung railway; (26 and 27) P'iao Shan; (28 and 29) The Yellow river at Lo-k'ou; (30) Shan-tung villager in winter clothes; (31) Group of villagers; (32 and 33) The Yen Ho between Ch'ing-chiang-p'u and Hai Chou; (34 and 35) Houses on the Yen Ho; (36) Village on the Yen Ho; (37) Hai-chou Shan from the east; (38) Hsin-p'u; (39) Flour and bean oil mills at Hsin-p'u; (40) The Yen river at Hsin-p'u; (41) Hsia-k'ou, the port of Ch'ing-k'ou; (41 and 42) The Grand canal between Chin-kiang and Ch'ing-chiang-p'u; (43) Flood-gate on Grand canal; (44) House-boat on Grand canal; (45) Launch towing two passenger boats on Grand canal; (46 and 47) Salt-boats on Grand canal; (48 and 49) House-boats on the Yen Ho; (50 and 51) Salt-boats on the Yen Ho; (52) Sea-going junk at Hsin-p'u; (53) A tub ferry; (54) Cart at Ch'ing-ko'u; (55) Wheelbarrow with sail; (56–61) Villagers of northern Chiang-su; (62) Rope-making; (63) British Concession, Kiukiang; (64) Ta-ku-t'ang on the P'o-yang lake; (65 and 66) Nank'ang Fu on the P'o-yang lake; (67) East side of P'o-yang lake opposite Nan-k'ang Fu; (68) East side of P'o-yang lake north of Nan-k'ang Fu; (69) Lower course of the Fu Ho; (70) Delta country on the lower Fu Ho; (71) The Fu Ho near Kuang-ch'ang Hsien; (72) Hills south-west of Kuang-ch'ang Hsien; (73) A valley near Ning-tu Chou; (74) The Ning-tu Ho, 35 miles below Ning-tu Chou; (75) Village near Kiukiang; (76 and 79) Village on the Fu Ho; (77) A market town on a river; (78) The Kan Chiang near Nan-ch'ang Fu; (80) A typical village; (81) A typical house; (82) East suburb and bridge of Fu-chou Fu; (83) Stone arch bridge; (84) Junction of the Kuei Shui with the Fu Ho near Chien-ch'ang Fu; (85 and 86) House-boats; (87) Chien-ch'ang Fu boat; (88) Ning-tu Chou boat; (89) Kan-chou Fu boat; (90 and 92) Cargo boat on the Kan Chiang; (91) Small boat on the Kan Chiang; (93) Ferry-boat on the Kan Chiang; (94) Cormorant fishers' boat; (95–97) Villagers.

India and Burma. **Waley.**

Eighty-one photographs of India and Burma, taken by A. S. Waley, Esq. *Presented by A. S. Waley, Esq.*

These photographs vary in size and merit, but many of them are very good, especially the larger views of Indian buildings and scenery.

(1) Bombay; (2) Scene at Bombay; (3) Victoria terminus, Bombay; (4) General Post Office, Bombay; (5) Mrs. Sassoon's house, Bombay; (6 and 7) View from Mrs. Sassoon's house; (8–10) Jaipur; (11) Arrival of Viceroy at Jaipur; (12) Just before arrival of Viceroy, Jaipur; (13) Viceroy passing stand, Jaipur; (14) Native soldiers, Jaipur; (15 and 16) Amber, Jaipur; (17) The palace of Amber; (18) Great Durbar hall, Amber; (19 and 20) Calcutta from the river; (21) On the river, Calcutta; (22) The great banyan tree, Calcutta; (23) On the Hugli; (24) Temple, Ahmedabad; (25) Types of Bhutans in the Himalayas; (26) Darjiling; (27) The mountain railway, Darjiling; (28) The market, Darjiling; (29) Great Gateway of Delhi mosque; (30) Street scene, Delhi; (31) Delhi; (32) Agra; (33–35) The Taj Mahal, Agra; (36) The Himalayas from Darjiling; (37) Arrival at Rangoon; (38) Rangoon; (39) Street scene, Rangoon; (40) A bungalow at Rangoon; (41) On the river, Rangoon; (42) Elephants stacking timber, Rangoon; (43) Prisoner and warder, Rangoon; (44) "Good-bye," Rangoon; (45 and 46) The Great Bell, Mingoon; (47 and 48) The Great Temple, Mingoon; (49) Pagoda, Mingoon; (50) Queen's Golden Monastery, Mandalay; (51) Queen's Silver Monastery, Mandalay; (52) The base of the Great Pagoda, Mandalay; (53) Entrance to the Great Pagoda, Mandalay; (54) View near Great Pagoda, Mandalay; (55) Scene on Irawadi at Mandalay; (56 and 57) Scene at Mandalay; (58) Street scene at Mandalay; (59 and 60) The burial of a bishop,

ceremony at Mandalay; (61) The Commissioner's house at Bhamo; (62 and 63) Street scene, Bhamo; (64) Monastery at Bhamo; (65) Pagoda at Bhamo; (66) Government launch at Bhamo; (67) Myitkyina; (68) Government launch at Myitkyina; (69) A Burmese house at Myitkyina; (70) Our camp at Pedong; (71) Cutting up venison, Pedong; (72) Our baggage mules; (73) The boat that brought us from Bhamo; (74–80) Scenes on the Irawadi; (81) On the banks of the Irawadi.

Mauritius.

Twenty-four views of Mauritius. *Presented by the Rev. James Forrester Anderson.*

An interesting little set of photographic views of Mauritius, printed on the backs of post-cards.

(1) The landing of the Duke of York, Port Louis; (2) Government House, Port Louis; (3) Company's Gardens, Port Louis; (4 and 5) Vallée des Prêtres and Peterboth mountains; (6) La Baie du Corsaire, Flic en Flacq; (7) The pirates' treasury, Flic en Flacq; (8) View in the Royal Botanical Gardens, Pamplemousses; (9) Kiosk of Gouramis, Pamplemousses; (10) The Farquhar pond, Pamplemousses; (11) Sago-tree Avenue, Royal Botanical Gardens, Pamplemouses; (12) Entrance to the Botanical Gardens, Cure-pipe; (13) Railway bridge over the Grand river north-west ravine; (14) The racecourse, Vacoas; (15) Quarantine station at Point aux Canonniers; (16) Landing-place at Point aux Canonniers; (17) St. Martin creek; (18) Near St. Martin creek; (19) Souillac creek; (20) Tramway bridge over the Jacotet river; (21) Entrance to the railway station. Mahébourg; (22) La Chaux river, Mahébourg; (23) Le Mouchoir Rouge island, Mahébourg; (24) Lighthouse, Fouquets island.

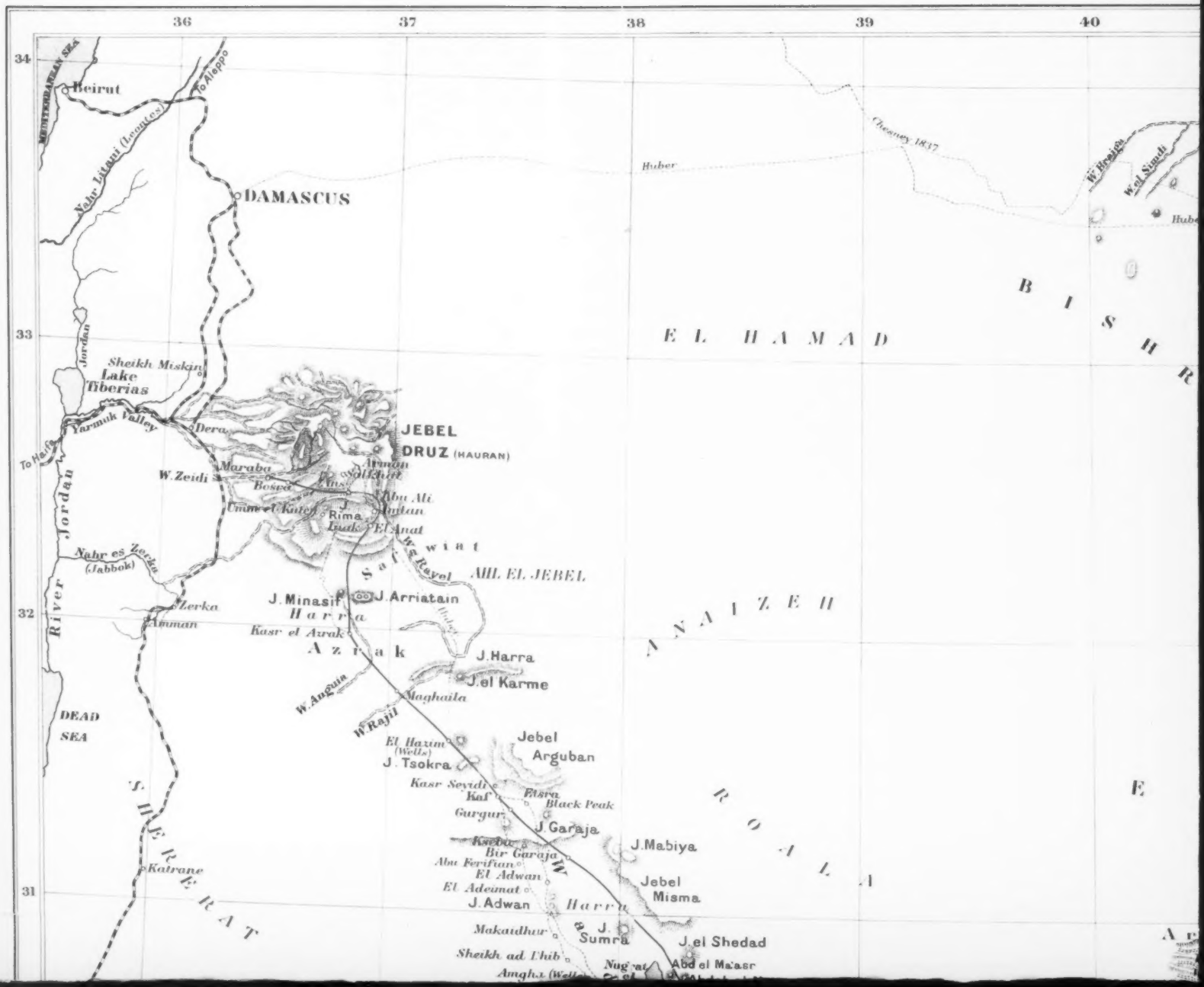
Uganda. **Fishbourne.**

Eighty-four photographs of Uganda, taken by Lieut. C. E. Fishbourne, R.E. *Presented by Lieut. C. E. Fishbourne, R.E.*

These photographs were taken during Lieut. Fishbourne's surveying expeditions in Uganda, an account of which was published in the *Geographical Journal* for February last.

(1) Bringing up a dug-out for use on the Nile; (2) A halt in a banana plantation; (3) Pitching camp at Nakabugu; (4) Monument to Major Thruston, who was killed in the mutiny of the Sudanese troops; (5) Papyrus-fringed southern shore of Lake Kioga; (6 and 7) Floating papyrus islands in Lake Kioga; (8) View north from Wabucria, where Nile flows into Lake Kioga; (9) The hills on the Bululu peninsula; (10) The entrance to the Bululu channel; (11) Steel boats being towed by the launch on Lake Kioga; (12) Crossing Lake Kioga in dug-outs; (13) A dug-out on Lake Kioga; (14) Launch towing a dug-out on Lake Kioga; (15) Large dug-out; (16) Embarking on Lake Kioga; (17) Stork shot on Lake Kioga; (18 and 19) The north shore of Lake Kioga; (20) Landing on north shore of Lake Kioga; (21) Camp on north shore of Lake Kioga; (22–24) Survey camp at Bululu; (25) Huts of Sudanese escort at Bululu; (26) View looking south from Bululu; (27) Natives at Bululu bringing grass; (28) Siroti camp; (29) Siroti hill; (30 and 31) Erecting beacon on Siroti hill; (32) Theodolite being carried up Siroti hill; (33) View north-east from Siroti hill; (34) Porters and theodolite at Kateta; (35) Lieut. Fishbourne and N.C.O. at Ogera trigonometrical station; (36 and 37) The road to Teso; (38) The chiefs of Teso and Komolo districts; (39) The track through the marshes to Teso; (40) Komolo camp; (41) A deputation of Komolo natives; (42) Gweri camp; (43) Kapiri camp near Lake Salisbury; (44 and 45) View from Kapiri hill looking east; (46) Kapiri rocks; (47) Zeriba's camp at Kapiri; (48) Lake Salisbury; (49 and 50) Local Court of Justice near Lake Salisbury; (51) Crossing the Basina marsh; (52) The postman; (53) Native women cleaning camp; (54) Bukedi woman and child; (55) Bukedi village surrounded by grain crops; (56) Swahili porters packing up rice prior to a long trek; (57) The fate of the thief who tried to steal the chronometers; (58) Young male elephant; (59 and 60) Lieut. Fishbourne and the young elephant; (61) Elephant being fed on milk out of a teapot; (62) Sabaki and the elephant; (63 and 64) Bumiro jungle; (65) A halt on the track, Bumiro; (66) Bumiro women; (67) Group on Dokolo hill; (68) Entrenched camp at Mount Kaga; (69) A track crossing a papyrus swamp, Unyoro; (70) Native track; (71) Sub-Commissioner's house at Hoima; (72) An ivory caravan at Hoima; (73) View east from Hoima; (74) View from Hoima; (75) The king of Unyoro's jester; (76) Survey beacon, Unyoro; (77) The Hoima-Toro track; (78) Waganda canoes at Entebbe; (79 and 80) Crossing the Kafu river on Papyrus rafts; (81) The kitchen and kitchen staff; (82) Camp near Mbendi; (83) Lake Isolt.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.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Beirut
To Aleppo
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DAMASCUS
Huber
Chesney 1837
W. Hesiya
W. el Simdi
EL HAMAD
Sheikh Miskin
Lake Tiberias
Jordan
Yarmuk Valley
Dera
JEBEL DRUZ (HAURAN)
To Haifa
Maraba
W. Zeidi
Bosra
Umm el Kutein
Rima
Ezraa
Nahr es Zerka (Jabbok)
River Jordan
Zerka
Amman
Safawi
Ar Rewel
AHL EL JEBEL
J. Minasif
J. Arriatain
Harra
Kasr el Azrak
Azrak
ANAIZEH
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W. Rajil
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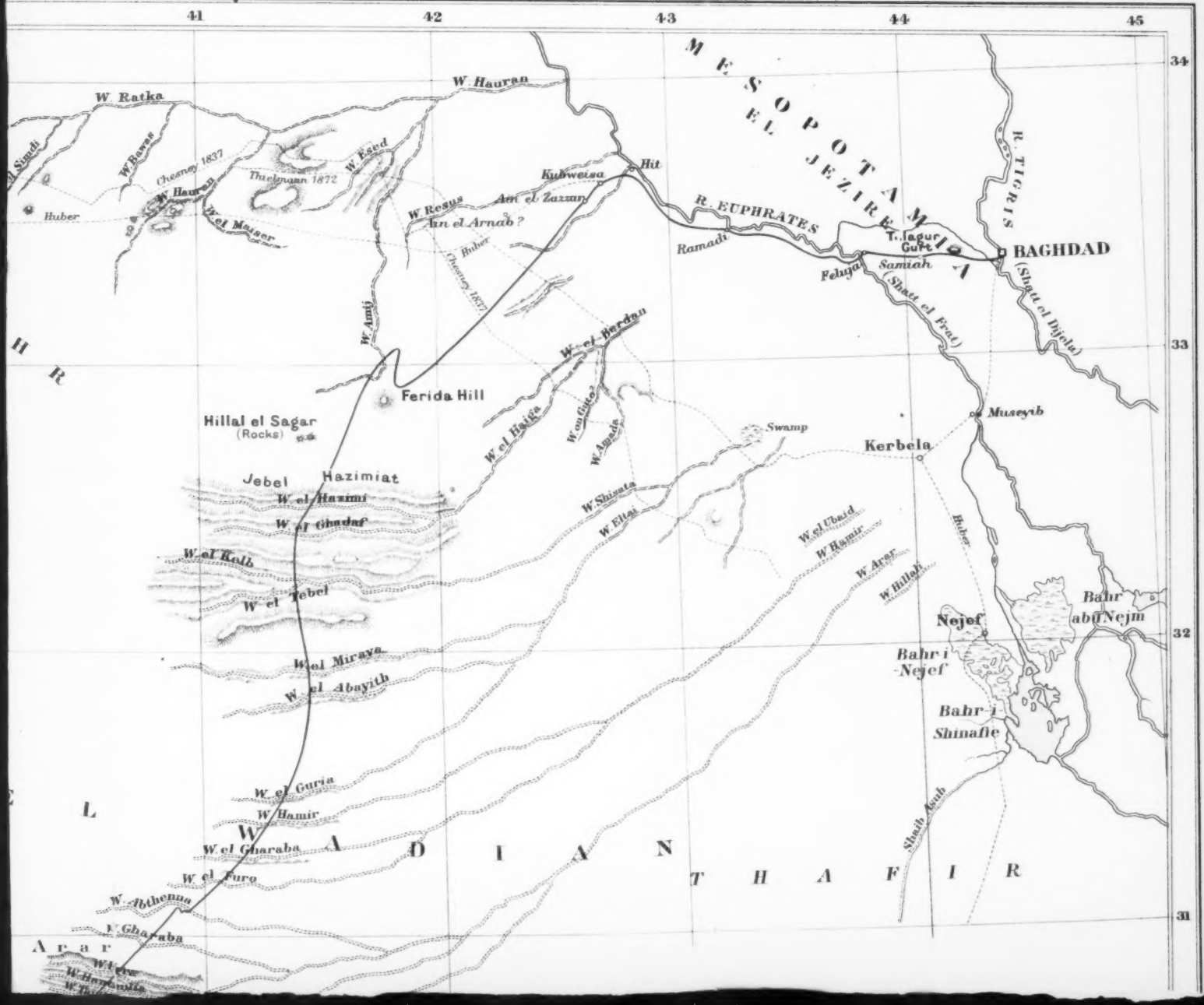
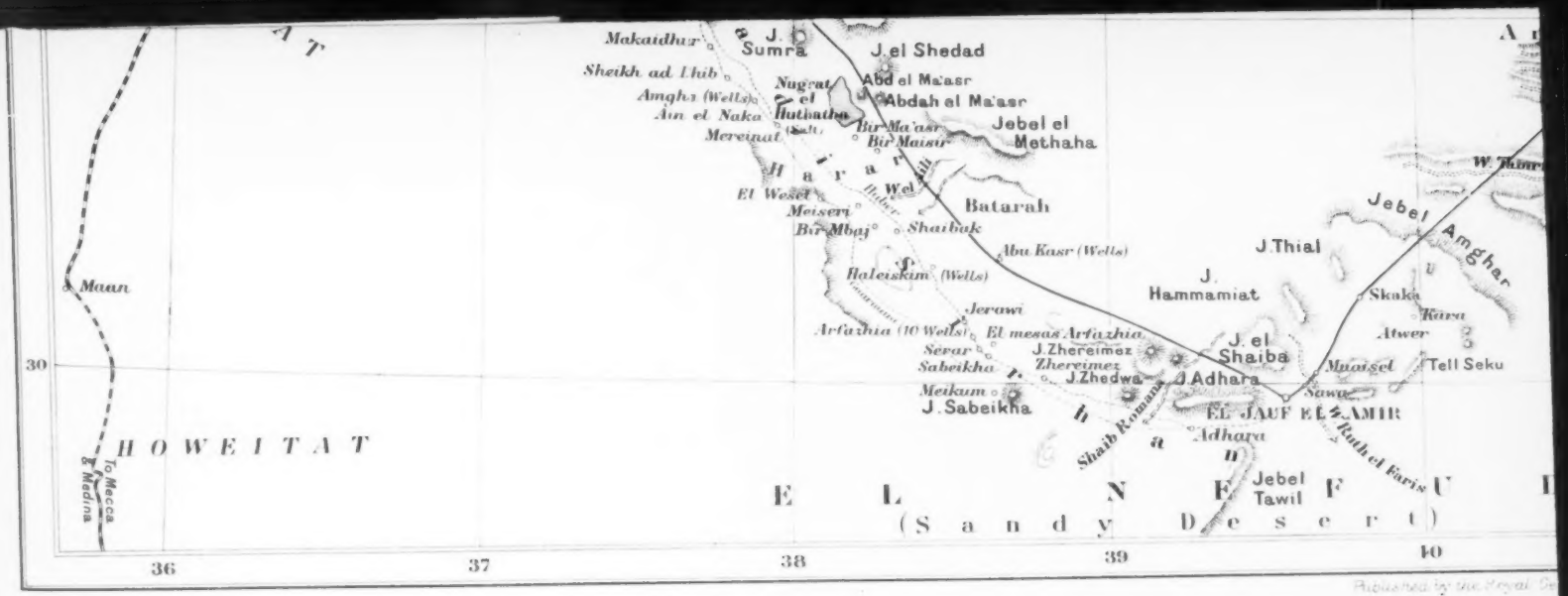
J. Tsokra
Jebel Arguban
Kasr Seyidi
Kaf
Black Peak
Gurgur
J. Garaja
J. Mabiya
Bir Garaja
Abu Ferifian
El Adwan
El Adeimat
J. Adwan
Jebel Misma
Harra
Katrane
Makaidhur
J. Sumra
J. el Shedad
Sheikh ad Dhib
Abd el Ma'asr
Amgha (Wells)
EL HAMAD

BAGHDAD to DAMASCUS
Butler & Aylmer.




Makaidhur
J. Sumra
J. el Shedad
Sheikh ad Dhib
Nugrat el Hutbatha
Abd el Ma'asr
Abdah el Ma'asr
Amghar (Wells)
Ain el Naka
Mereinat
Bir Ma'asr
Bir Maisur
Jebel el Methaha
Harra
El Weset
Meiseri
Bir Mbaj
Batarah
Shaibak
Abu Kasr (Wells)
J. Thial
Jebel Amghar
Maan
Haleiskim (Wells)
J. Hammamiat
Skaka
Kara
Atwer
Jerawi
Arfazhia (10 Wells)
El mesas Arfazhia
J. el Shaiba
Muaisel
Tell Seku
Sevar
Sabeikha
J. Zhereimez
Zhereimez
J. Zhedwa
J. Adhara
Meikum
J. Sabeikha
Sawa
EL JAUF EL AMIR
Shaib Romana
Adhara
Ruhel Faris
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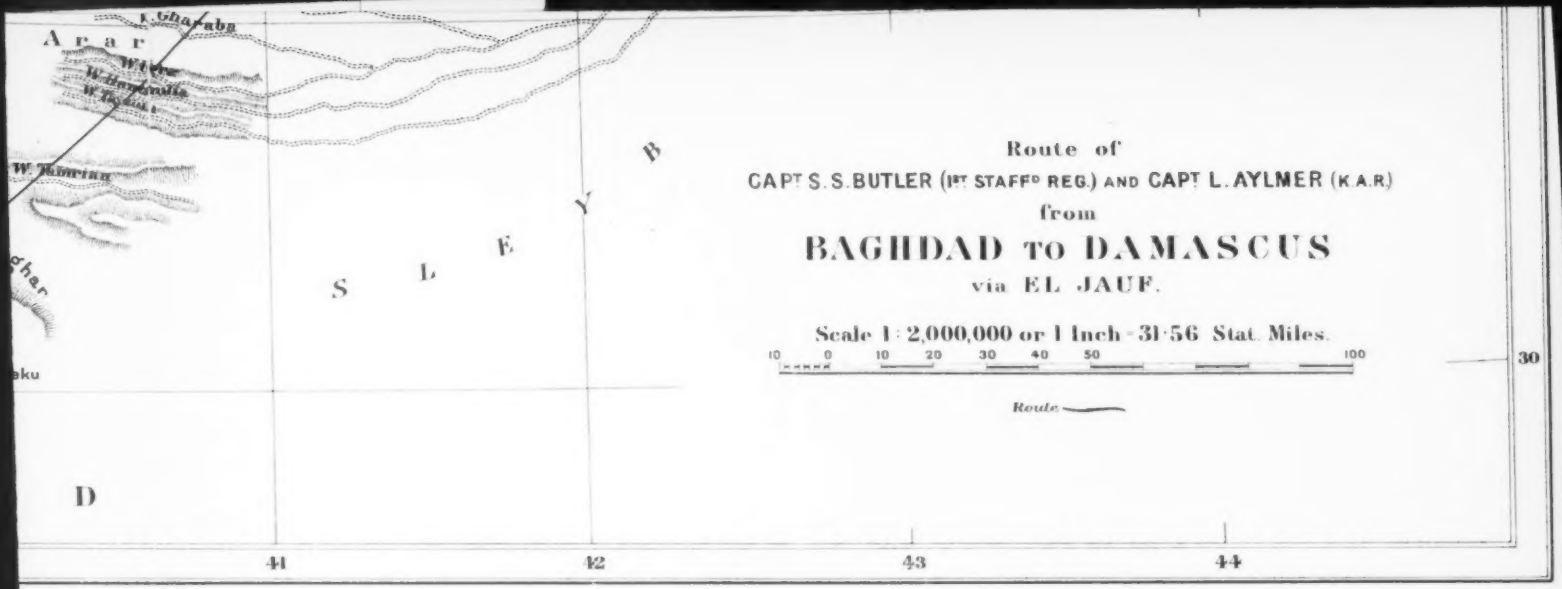

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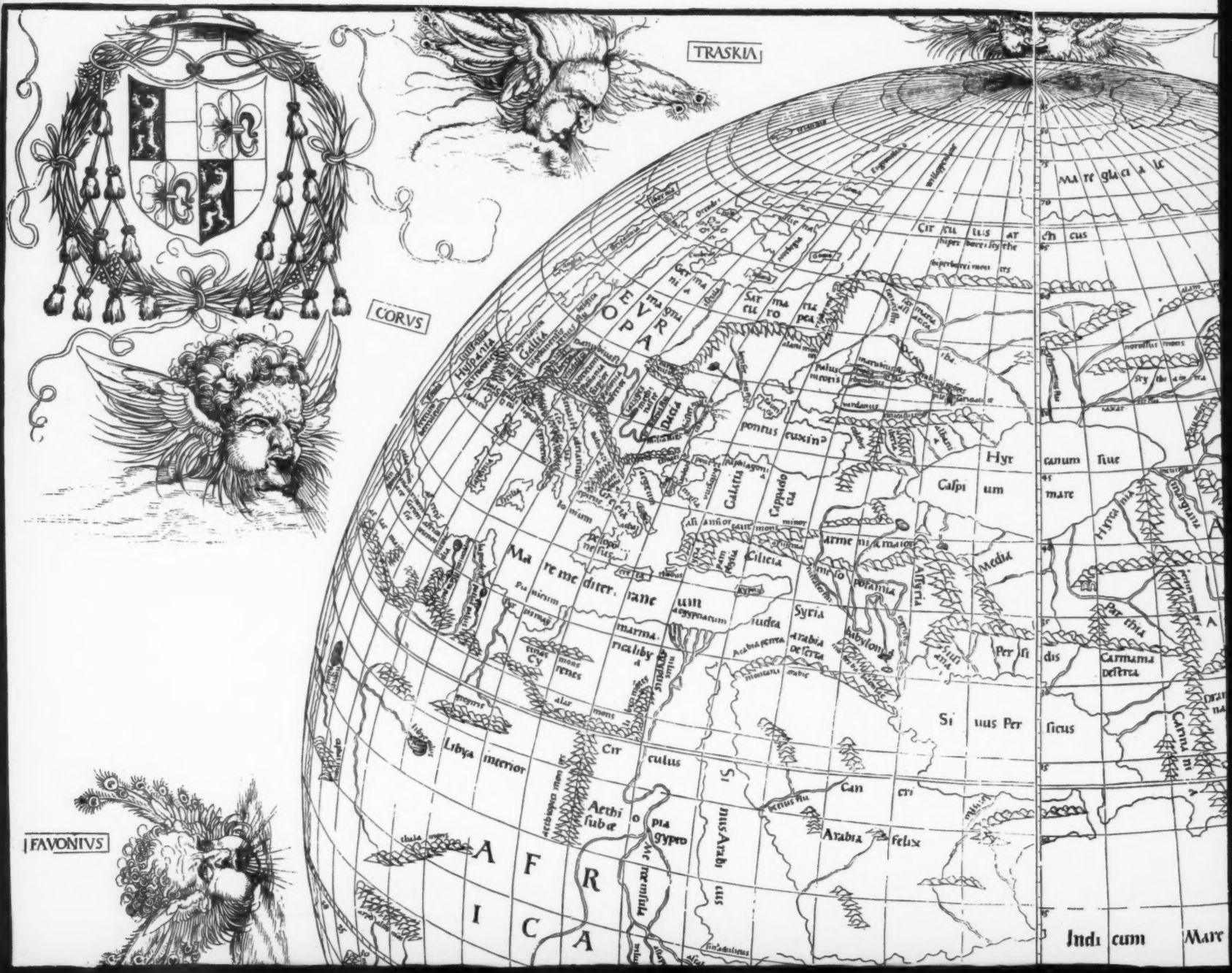
TRASKIA
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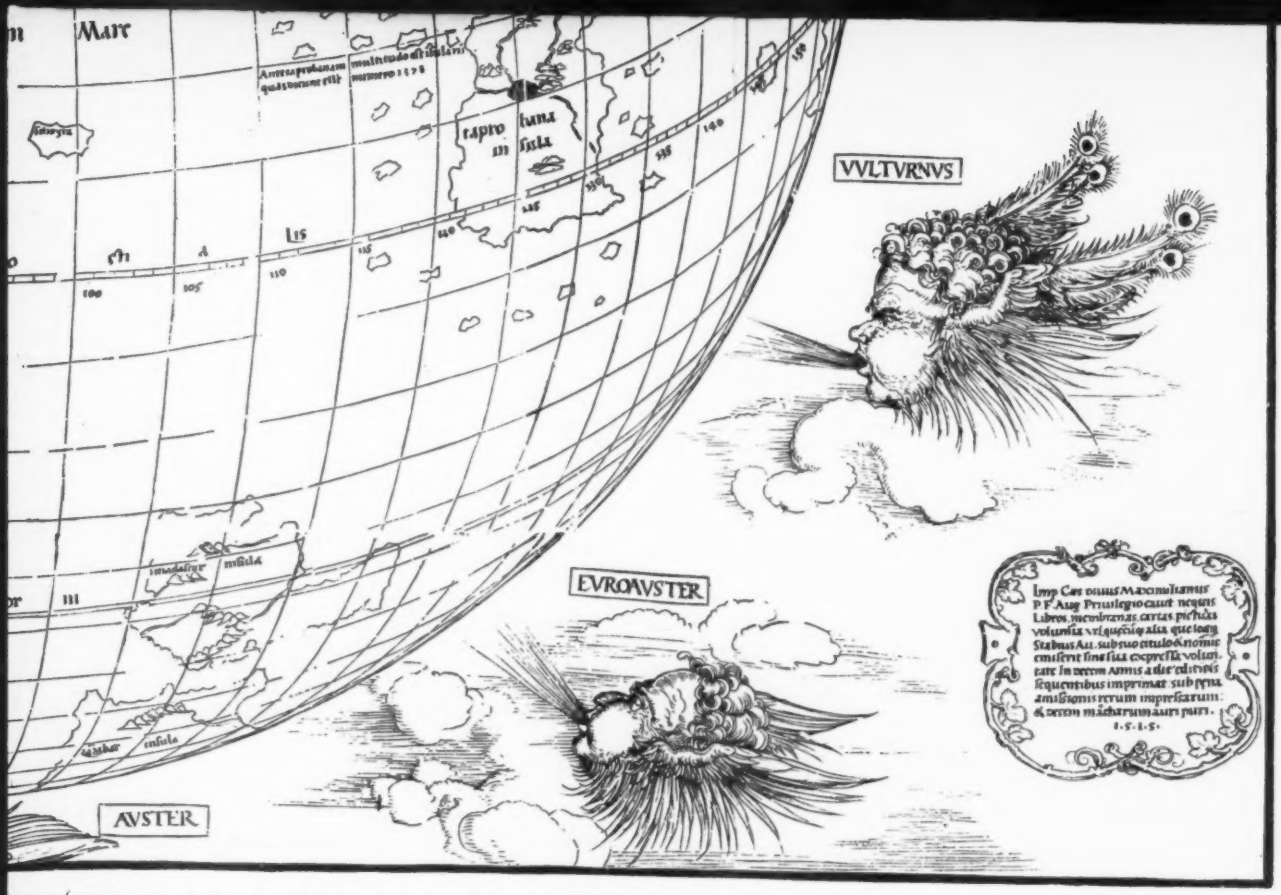
FAVONIVS
EVROPA
AFRICA
Mare glaciale
Indicum Mare
Libya interior
Aethiopia
Arabia felix
Mare mediterraneum
Syria
Assyria
Media
Persis
Carmania deserta
Hyrcanum siue Caspium mare
Ponticus Euxinus
Palus Maeotis
Cilicia
Iudea
Babylonia
Arabia deserta
Arabia petrea
Nilus
Gallia
Hispania
Italia
Graecia
Cappadocia
Mesopotamia

SEPTENTRIO
AQVILO
CAECIAS
SVBSOLANVS
Reuerendiss. domino et illustriss. Principi Dño Mathęo S. Angeli Diacono Cardinali Gurcen. Sa. Cæs. Hȳs per Italiã locũtenenti generali ẽ dño suo colen. Joañ Stabius Au. hãc orbis imaginem dedicat.
ASIA
Mare

WORLD MAP BY JOHANNES STABIUS AND ALBRECHT DÜRER A.D. 1515.(F

Published by the Royal Geographical Society.



515.(FROM THE COPY IN THE BRITISH MUSEUM.)